WIRE AND WIRE PRODUCTS

JANUARY 1960

For clean-keeping,
snarl-free wire coiled
in drum, pack or pail—

Photo Courtesy TECHALLOY CO. INC., Rahns, Pa.

"Quick on the Draw!"

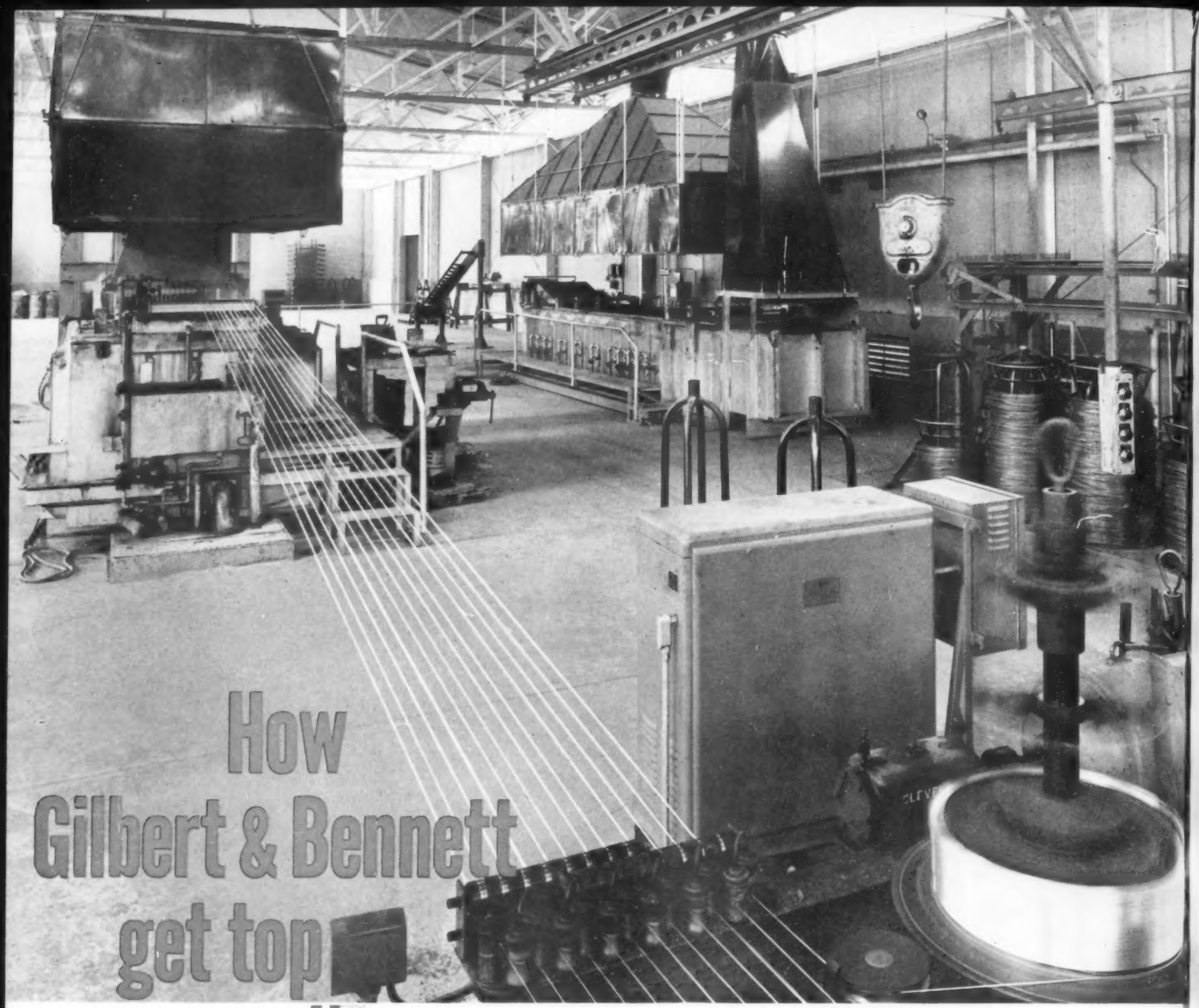
The Vaughn®
20 STRAND
MULTI-PAK UNIT

Many wire producers today find that protecting good wire in package or payoff drum pays excellent dividends in greater customer acceptance. Wire is kept clean and free of snarls, handling is easier, bright-labeled brand identification is unquestionably profitable.

To meet the demand, Vaughn-developed Multi-Pak Units serve a wide range of requirements smoothly and efficiently. Here is our 20-strand unit—typically Vaughn in well-engineered performance. Let us tell you about it, soon!

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION



How Gilbert & Bennett get top quality galvanized wire...fast!

New Lee Wilson line anneals, cleans and coats in one continuous operation—

The new Lee Wilson Continuous Lead Annealing and Galvanizing line was recently set into operation at Gilbert and Bennett Manufacturing Company's Blue Island, Illinois plant for volume production of galvanized wire. The entire line from pay-off reels through lead annealing, acid rinse, zinc coating to take-up reels was engineered to a minimum of floor space while producing 2400 pounds of coated wire per hour. It will carry a maximum of 12 strands simultaneously.

Lee Wilson Annealing and Galvanizing lines are engineered around the principle of radiant tube heating. This method, pioneered by Lee Wilson engineers, permits far more accurate heat control, cuts drossage in half and doubles pot life. Because all combustion is completed in the alloy elbow, flame impingement on pit walls is eliminated, and there are no overheated areas to cause boiling of dross.

Lee Wilson
ENGINEERING COMPANY, INC.
20005 LAKE ROAD • CLEVELAND 16, OHIO

HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

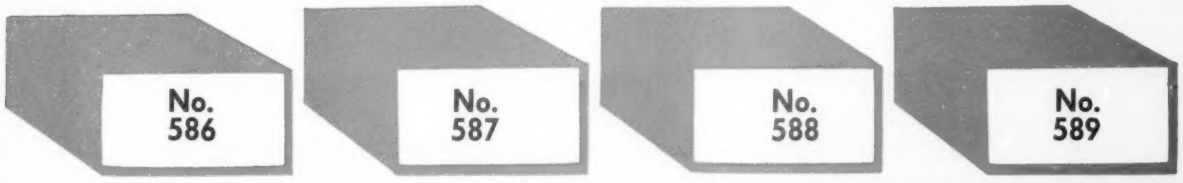
*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNACES

PRESENTING

THE "580" GROUP • • •

A New Series of "Full Range Lubricants"

"America's Finest Wire Draw"



1. **Designed for practical application in any mill as a General Purpose Lubricant.**
2. **Now in daily use as a Spring and Rope Wire Lubricant.**
3. **Designed to permit substantial "leaning," to meet specific in-plant and customer requirements.**
4. **Mill Tested and Approved for both High and Low Carbon Steel and numerous Ferrous and Non-Ferrous Alloys.**
5. **Our field service representatives are available to review this entire series at your convenience.**
6. **No. 588 is also proving an excellent mat stock lubricant where mechanical descaling of rods is desirable.**
7. **In many cases mills have found the use of one of the 580 series has permitted increased speeds of 100%.**

"Look to Standard for the Future"

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Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

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COMPOUNDS CO., INC.
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wire and cable industry... **THE BLANE MAN SERVES YOU!**

1. COMPOUNDING a complete line of vinyl molding and extrusion compounds.
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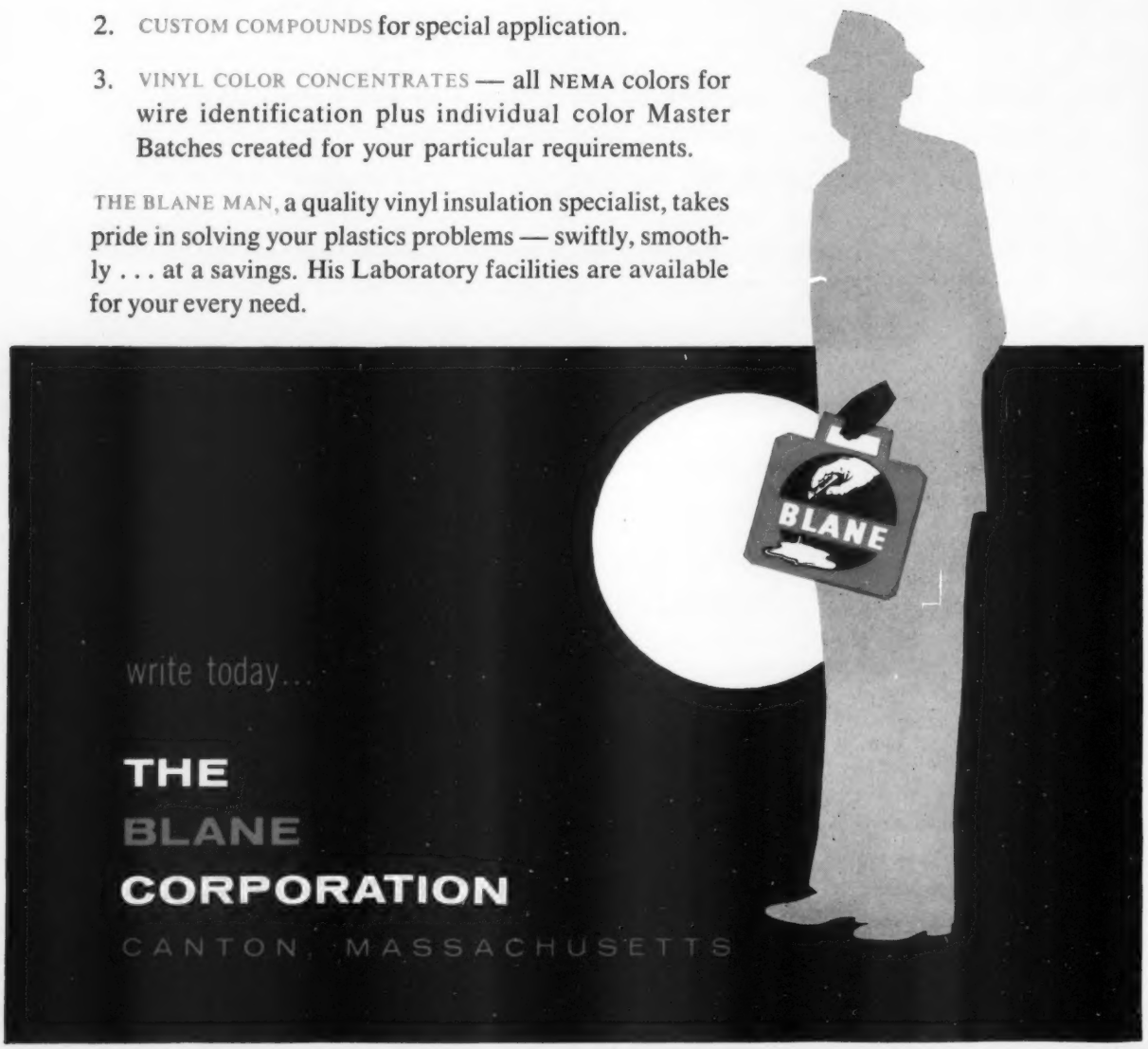
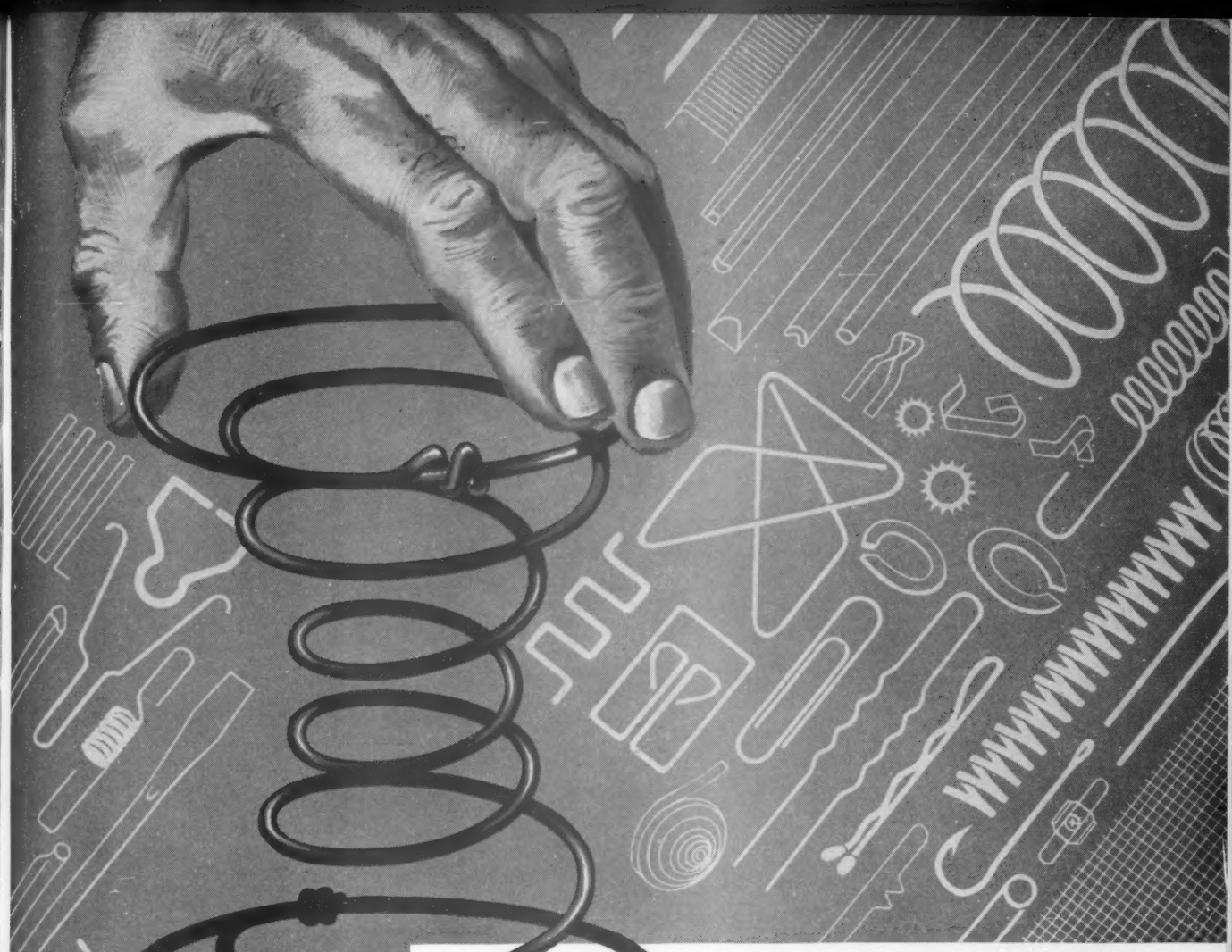
3. VINYL COLOR CONCENTRATES — all NEMA colors for wire identification plus individual color Master Batches created for your particular requirements.

THE BLANE MAN, a quality vinyl insulation specialist, takes pride in solving your plastics problems — swiftly, smoothly . . . at a savings. His Laboratory facilities are available for your every need.





LET'S TALK WIRE!

This spring is typical of hundreds of types and sizes of springs made from PAGE wire—and springs are just one of the many end products for which PAGE manufacturers wire is a logical choice.

Regardless of your use of wire, you can count on PAGE uniformity. Whether you make hairpins or lock washers, PAGE wire will give you the tensile strength, ductility, finish, tolerance and other properties you require.

PAGE facilities are designed to produce a wide range of high quality manufacturers wire items—including special shapes. Where requirements are exacting, you will find PAGE wire unexcelled.

Since 1902, we have pioneered many "firsts" in the wire industry. The latest of these is corrosion-resistant ACCO Aluminized Wire—commercially pure aluminum bonded to a steel core.

Why not put PAGE experience and knowledge to work for you to improve your product and lower your costs.

Let's get together and talk wire!

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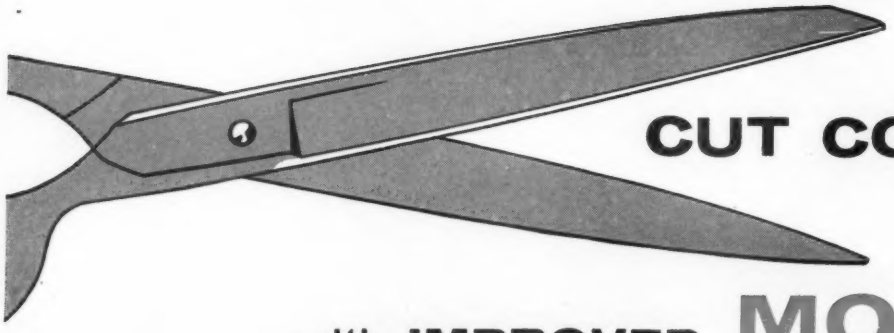
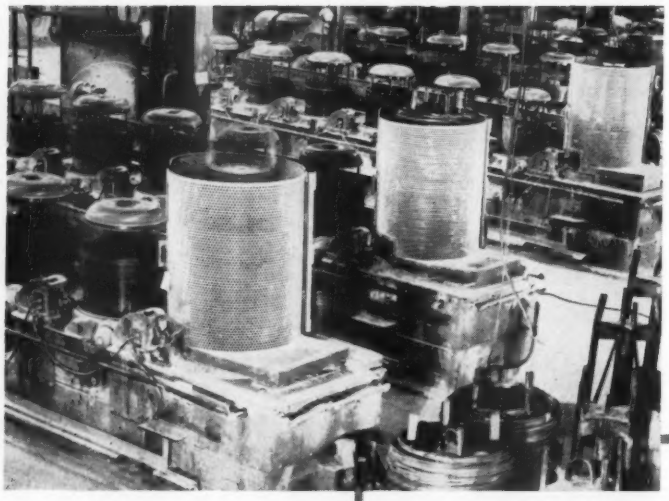
PAGE *-the source for answers to wire problems*



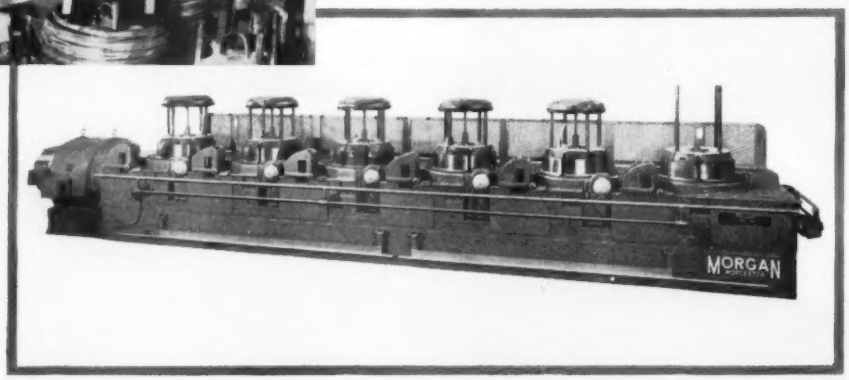
CUT COSTS

with **IMPROVED** MORGAN CONNOR



Wire Machines

You get the best in production-proved equipment with the latest refinements when you use Morgan-Connor Wire Machines. These machines enable you to produce large, heavy-weight bundles rapidly with low power costs and minimum space requirements.



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WIRE AND WIRE PRODUCTS*

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 35 January, 1960 No. 1

Designated as Official Publication By The Wire Association

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A clean cut?

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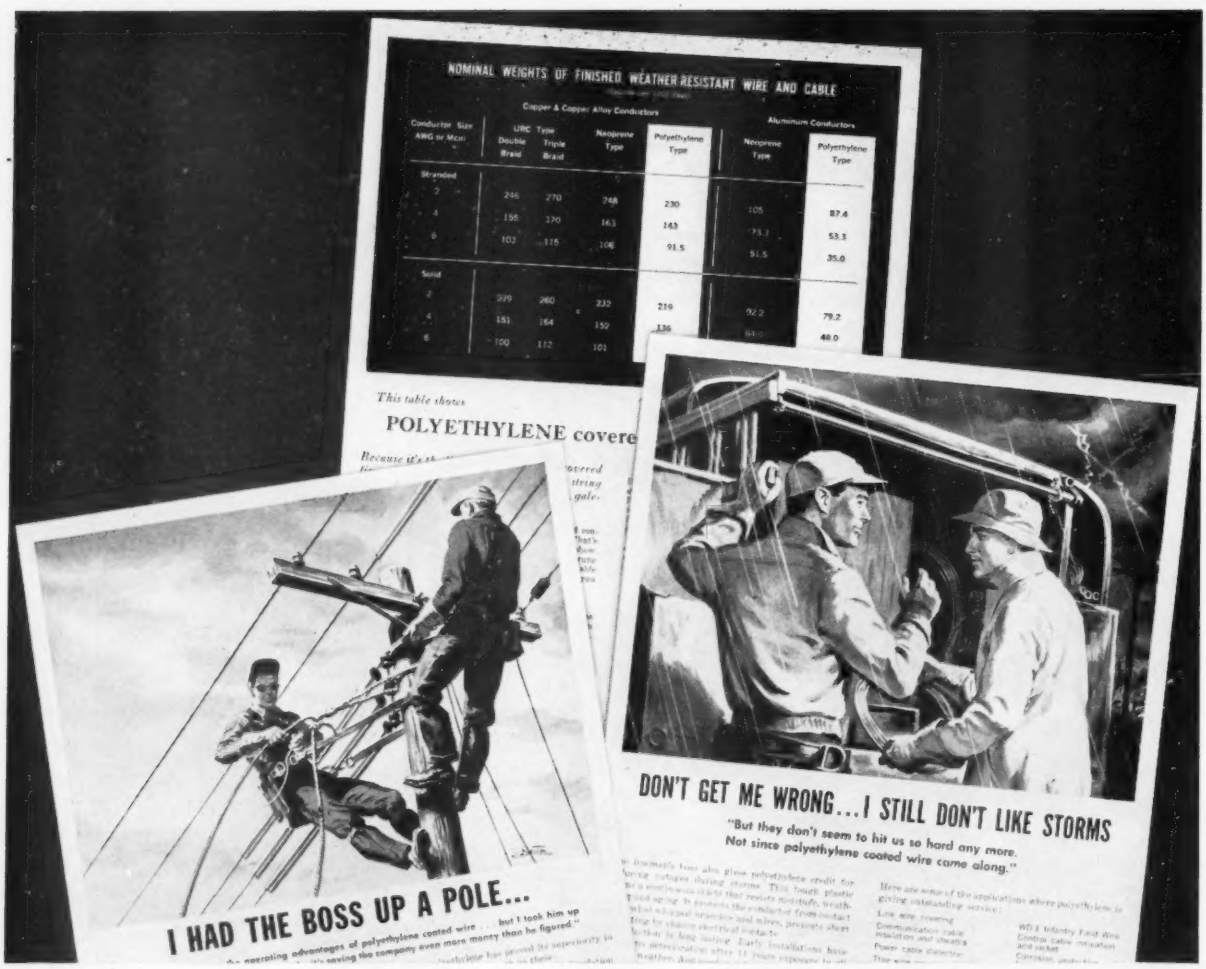
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"But they don't seem to hit us so hard any more. Not since polyethylene coated wire came along."

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Polyethylene-covered line wire has many advantages for users: Exceptional weather and stress-crack resistance. Easy handling and installation. Long life in service. Fewer outages and minimum maintenance.

We've been telling your customers the polyethylene story in utility magazines through advertisements like those above. And more and more users are specifying polyethylene covering for line wire and many other applications. Why not join us in this effort?

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As you make recommendations, you will find our new data sheet, "PETROTHENE® Resins for Wire and Cable Industry", helpful in selecting resins with the proper balance of properties for different applications. Also available is U.S.I.'s comprehensive 100-page "PETROTHENE Polyethylene . . . A Processing Guide." Write for your copies.

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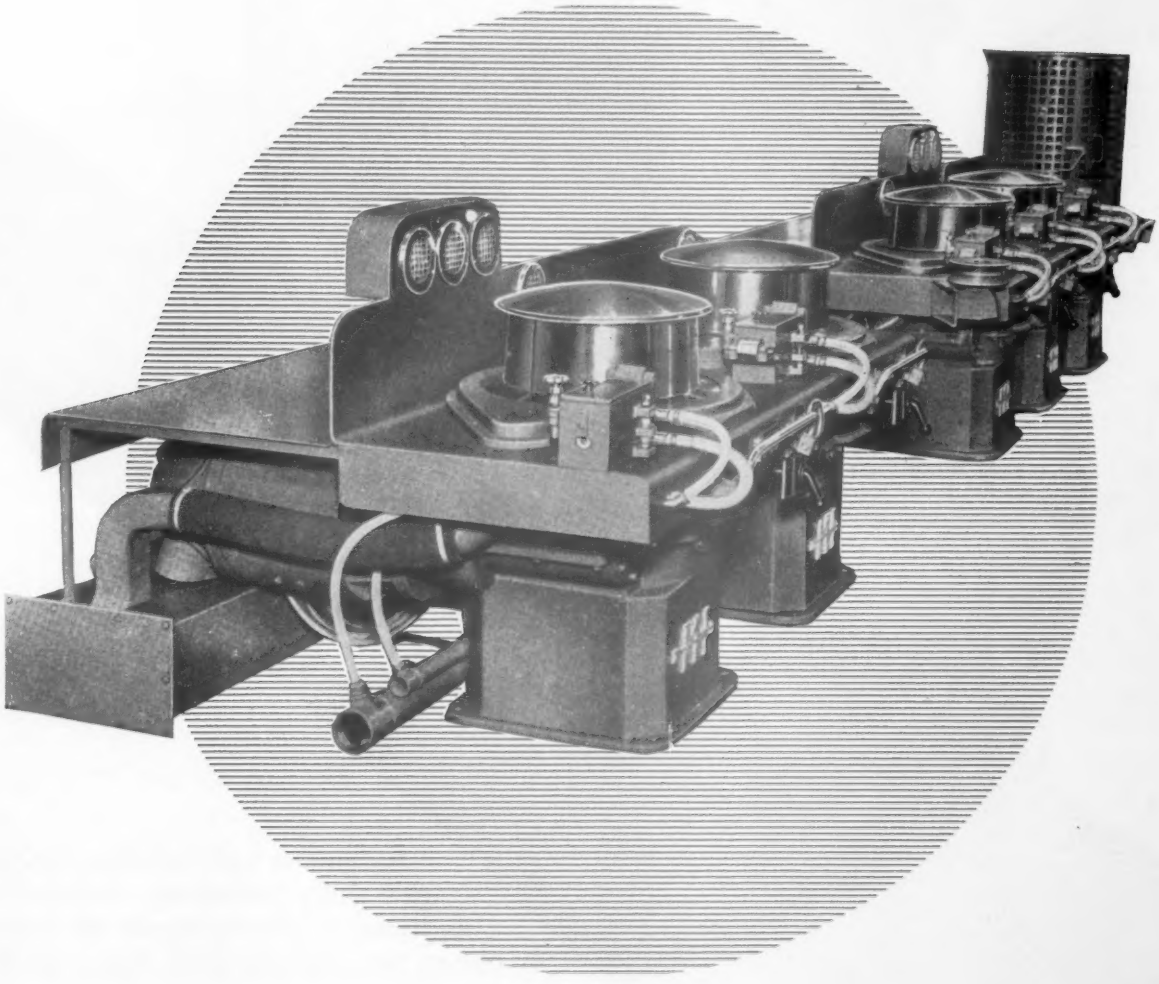
PRECISION WITH RUGGEDNESS



FOR GREATER FLEXIBILITY

This BEELINE DG-4 is designed and built to operate as two independent machines with two and three blocks OR as one machine with five blocks.

We pride ourselves in delivering complete machines, jobtested and ready to put into operation with a minimum of labor and installation expense.

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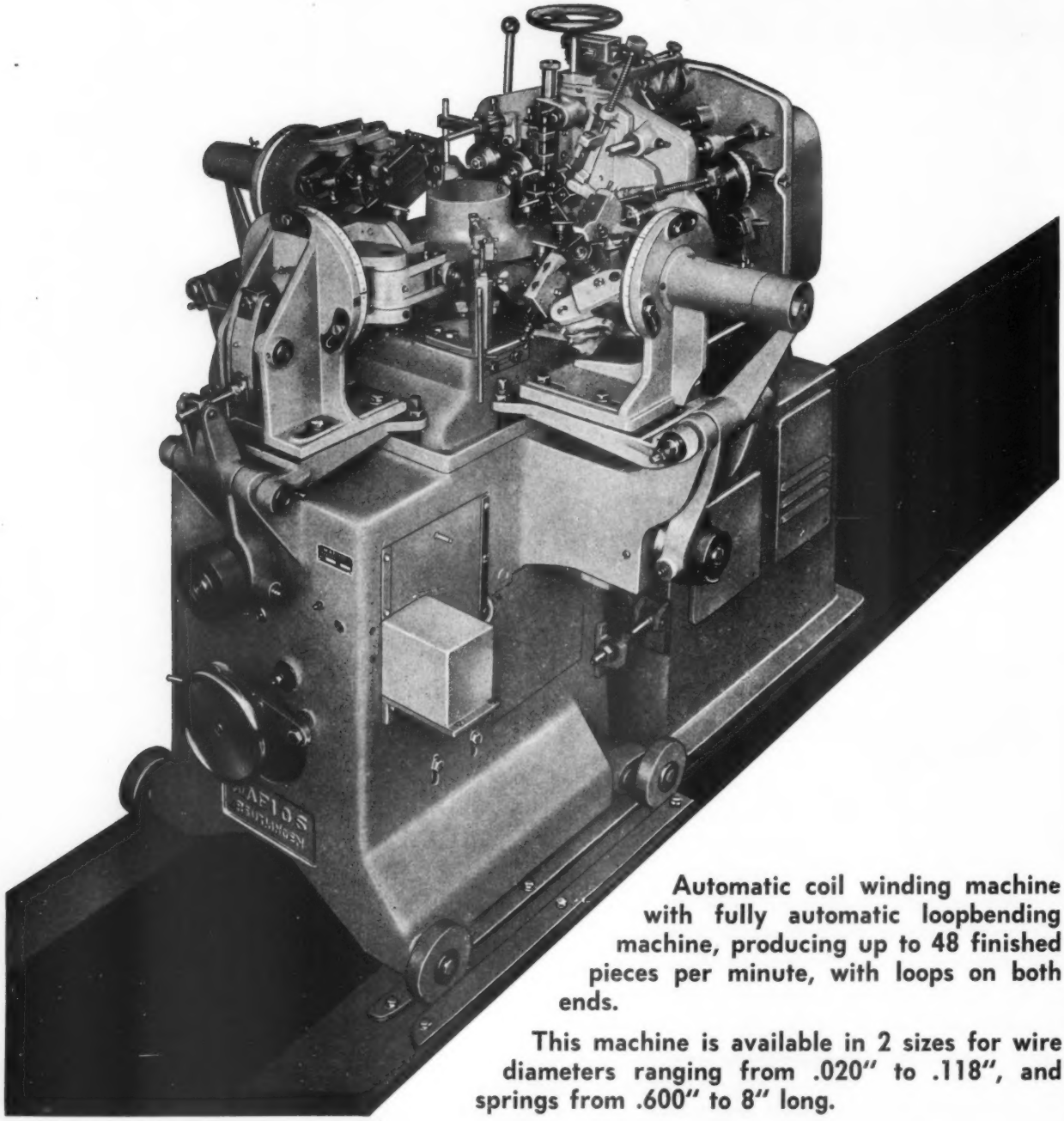

Automatic coil winding machine with fully automatic loopbending machine, producing up to 48 finished pieces per minute, with loops on both ends.

This machine is available in 2 sizes for wire diameters ranging from .020" to .118", and springs from .600" to 8" long.

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Good news in Anti-friction action...

SWIFT now offers a FAMILY OF FIVE...

Swift's new line of high heat resistant, long mileage lubricants are now available to serve a variety of drawing and metal processing jobs.

Flexals are extremely versatile. A wide range of chemical and physical properties makes them particularly adaptable for difficult or highly specialized jobs. For example: Flexals can be furnished for cold heading, hot dip coating and dry drawing of high or low carbon wire. They can be soluble in water . . . or *insoluble* in both water and solvents. Melting points range to 800° F. They are offered in controlled grinds down to micron particle size.

Look over Swift's new *Family of Five* FLEXALS . . . with *your* process in mind. Then, write for details on a trial order of these versatile new ANTI-FRICTION lubricants.

SWIFT & COMPANY • Soap Department
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FREDDIE FLEXAL invites your further inquiry.

FLEXAL S	Hot dip, dry film lubricant and rich, dry drawing compound.
FLEXAL M2DS	Metallic stearate base for hard-to-work metals.
FLEXAL MCA	Metallic stearate base. Medium vari-grind compound.
FLEXAL MCF	Metallic stearate base. Rich, fine mesh drawing compound.
FLEXAL MCL	Lean, fine, dry lubricant for low carbon bright and cold heading wires.

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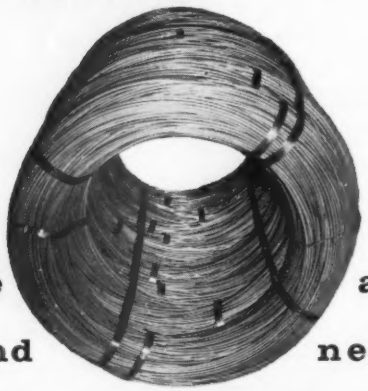
MARATHON STEEL WIRE



For all specialized steel wire applications, particularly for rollers, balls and needles in anti-friction bearings, Marathon offers advantages derived from more than 150 years experience in specialty steels. Marathon assures best workability and uniform quality of steel wire of all types —alloy, high speed, stainless, tool, heat resistant—available straight or in coils. Specify Marathon, too, for high quality forged alloy steel rolls for flat cold rolling. Contact us and expect immediate attention to all inquiries and individual problems.

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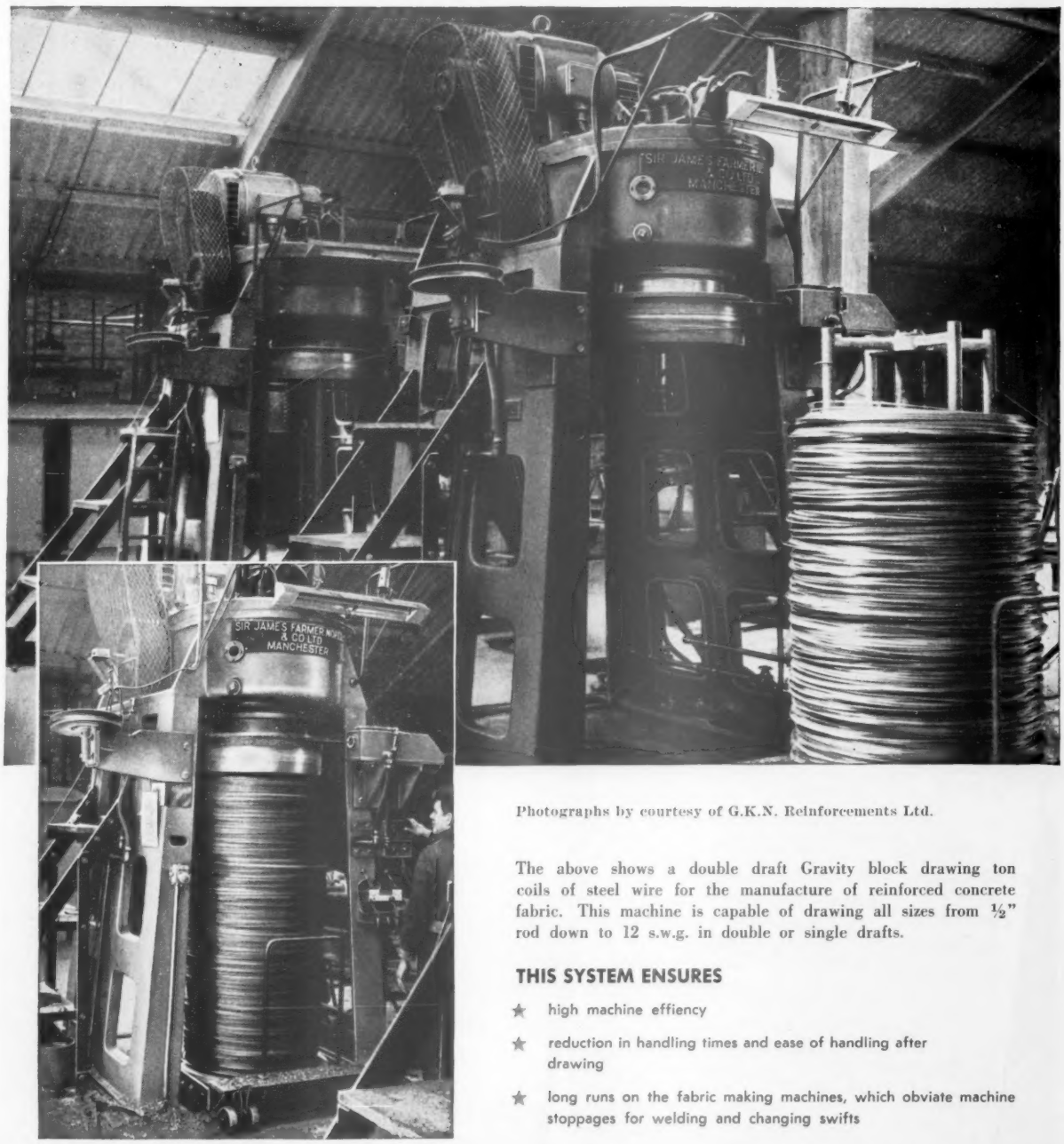

Photographs by courtesy of G.K.N. Reinforcements Ltd.

The above shows a double draft Gravity block drawing ton coils of steel wire for the manufacture of reinforced concrete fabric. This machine is capable of drawing all sizes from ½" rod down to 12 s.w.g. in double or single drafts.

THIS SYSTEM ENSURES

- ★ high machine effiency
- ★ reduction in handling times and ease of handling after drawing
- ★ long runs on the fabric making machines, which obviate machine stoppages for welding and changing swifts

Makers of all classes of Wire Drawing Machinery and pioneers of the inverted block system for handling large coil weights.

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ADELPHI STREET • SALFORD • LANCASHIRE • ENGLAND

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APEX 764-M
Cleaning Compound

APEX 764-M assures . . .

- **Rapid Removal of Metallic Soaps and Lime**
- **Long Solution Life**
- **Short Acid Immersion**
- **Tightly Adherent Plating**

APEX 764–M Cleaning Compound is a moderately alkaline, powdered form composition, especially formulated for removal of insolubles found on cold drawn steel wire.

Its use greatly enhances cleaning and reduces preparation time of hard drawn wire that is to be subsequently copper or liquor finished.

Inquiries Invited!

APEX ALKALI PRODUCTS CO.

Lubricants & Cleaning Compounds for Wire and All Wire Products

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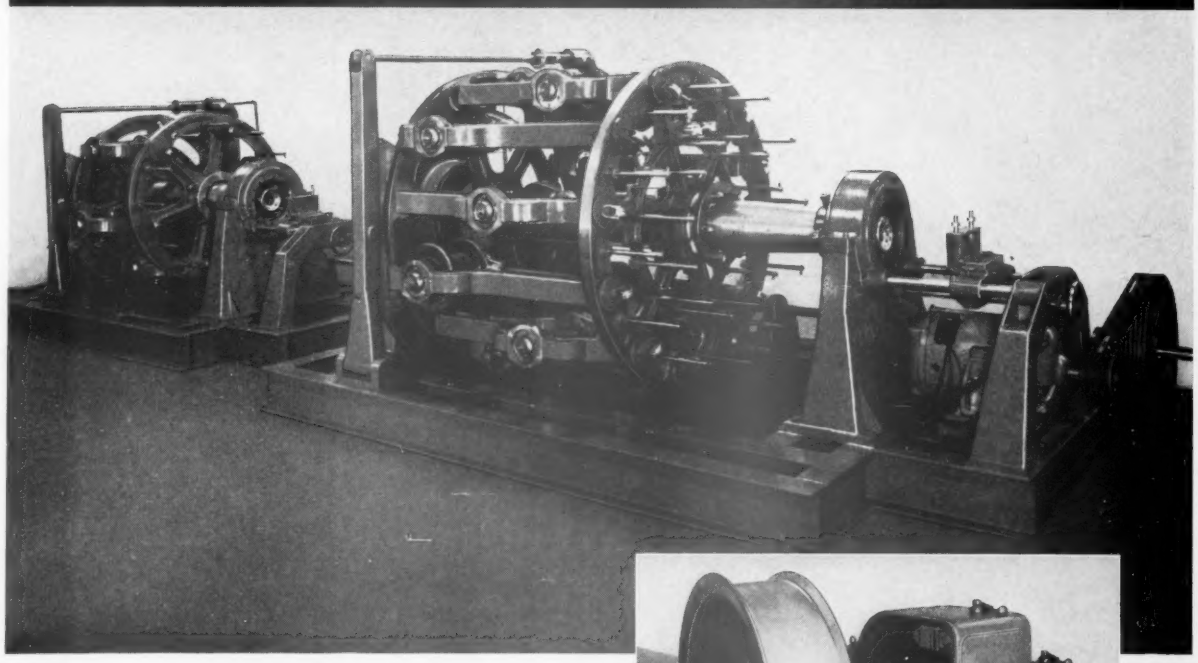
NEBUTTCO

Planetary Stranders

Planetary Strander with 6-12 head planetary sections for 16" dia. reels.



Designed and built with Nebuttco's long experience in manufacturing high quality cable-making machinery, these rugged Planetary Stranders are well known in the industry for their reliability in producing cables at a profit day in and day out.

These high speed machines can be supplied to accommodate a number of different reel sizes — and in various combinations for producing strands from 7 to 331 ends. Capstan units are available up to 96" diameter. We can also supply let-offs and take-ups as well as taping heads both concentric and eccentric. Write us for further information and details.

Capstan 60" dia. with grooved fleeting sheave.

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CABLERS
TAKE-UPS

NEBUTTCO

BUNCHERS
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Division Wanskuck Company
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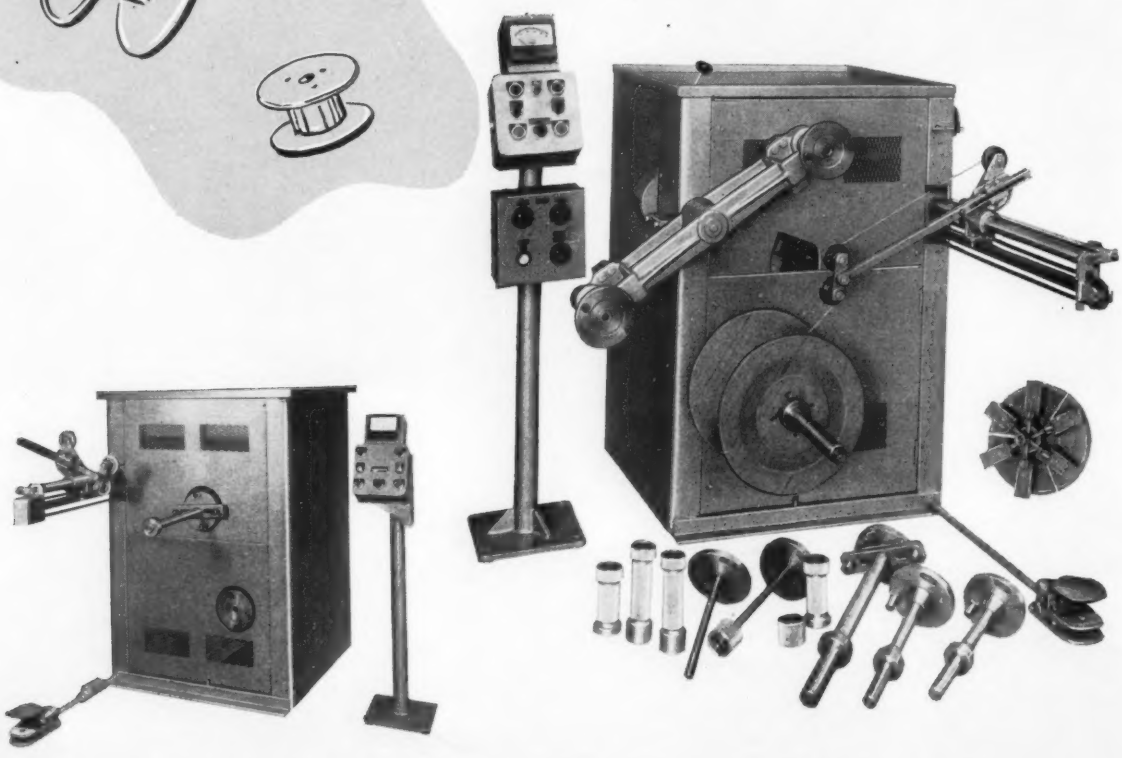
FLEXIBILITY *and Quality*

ALL ROLLED INTO ONE MACHINE

Top this off with performance and you have the Entwistle Model DS Respooler — Coiler for winding 7½" diameter spools, coils, non-returnable or 30" diameter shipping reels at speeds up to 1200 feet per minute.



MODEL DS — Single upper and lower drive spindle with quick change reel adaptor.

MODEL DSAP — Single upper and lower drive spindle, power indexed double-head turret and interchangeable reel arbors and coiling head.

A PACKAGING GEM VERSATILE ENOUGH TO FILL THAT GAP ANYWHERE IN YOUR PLANT

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WHITACRE 22″ WIRE DRAWING DEAD BLOCK

Continuous Production—Efficiency Approaching 100%

Gives you these advantages

Continuous increased production achieved by: • No down time for stripping • Permits packaging into stationary container or uninterrupted palletizing on stems • No tangling nor snarling from handling • Design simplicity. No back-gearing nor similar mechanisms • Greatly reduced floor space requirements • Dies in supplying drawing machine can be changed without stopping dead block • Accumulation type machines can be "run down" without stopping dead block • Continuous inspection and sampling • Breaks welded in production — low scrap loss • Increased production with lessened operator fatigue • Maintenance eliminated except for occasional lubrication of four main bearings and two motor bearings • Dead block can be located anywhere with wire literally piped from wire drawing machine • Extra large packages for in-process wire • Greatly reduced handling and in-plant transportation costs • Low capital investment.

OTHER MODELS AVAILABLE

16″ Wire Drawing Dead Block, Model DB-16A • 26″ Wire Drawing Dead Block, Model DB-26A • Combination 16″ and 22″ Galvanizing or Tinning Dead Block Take-ups, Model GB-2216A • 26″ Heavy Wire Galvanizing or Tinning Dead Block Take-up, Model GB-26B.

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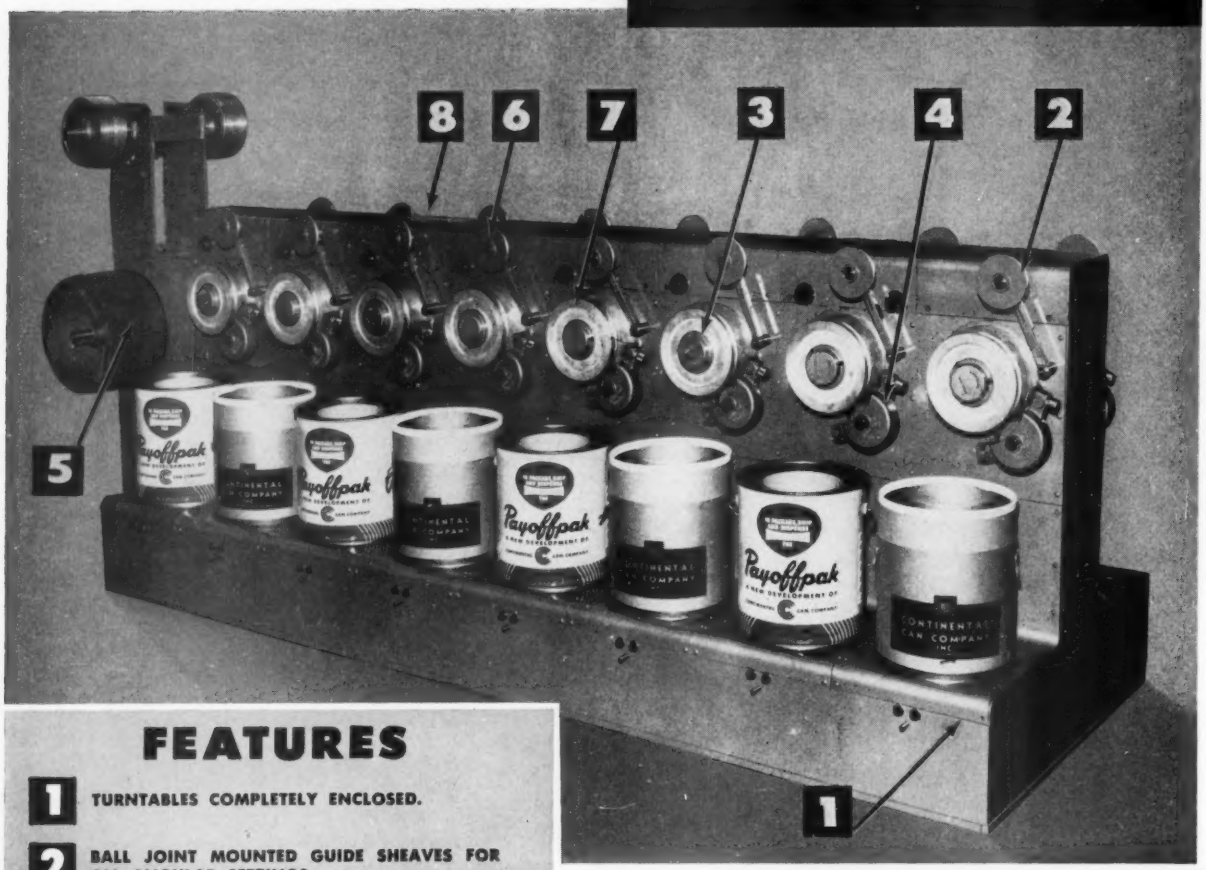
ANNOUNCING the WYREPAK



FEATURES

1. TURNTABLES COMPLETELY ENCLOSED.
2. BALL JOINT MOUNTED GUIDE SHEAVES FOR ALL ANGULAR SETTINGS.
3. ELECTRO-MECHANICAL TENSION CONTROL FOR EACH HEAD.
4. PRECISION GROUND PRESSURE ROLLS.
5. PRIME RUBBER LAGGED CAPSTAN.
6. ASSEMBLED AND ALL ADJUSTMENTS MADE WITH ALLEN SCREWS.
7. ALUMINUM CAPSTANS, WITH HARD-ANODIZED, POLISHED RUNNING SURFACES.
8. INDIVIDUAL MAINTENANCE ON EACH SECTION.

The drum packaging Take-Up System illustrated, Model S5-TC-S, was designed especially for Magnet Wire.

Other models are made for all types of ferrous and non-ferrous wires.

Advanced engineering and precision construction have evolved in this machine new concepts of speed and efficiency in the packaging of wire. Capacity: Min. size — #32 ga.; max. size — #20 ga. wire.

YOU ARE INVITED TO SECURE COMPLETE DETAILS REGARDING THIS ADVANCED PROCESS FROM —

Advanced Wyrepak Co., Inc.

11 HARRISON COURT PHONE: EDison 4-4274 BRIDGEPORT, CONN.

OR The Vaughn Machinery Co., CUYAHOGA FALLS, OHIO

to put the "brakes" on stripping...

Type 23 Thread-Cutting Nibscrew®* manufactured by Shakeproof Division of Illinois Tool Works, Elgin, Illinois

*Covered by U.S. Pat. No. 2,833,326

SHAKEPROOF specifies KEYSTONE XL WIRE

flowability

MAKES THE DIFFERENCE

The specially shaped Nibs under the head of this Shakeproof® Thread-Cutting Screw are designed to act as torque brakes. As the screw is driven, the Nibs make contact with the work surface and "eat up" excessive driving torques. This prevents stripping the threads from over-tightening and also permits a broader range of driver settings.

For effective braking action, each Nib must be sharp and precisely formed. So, material must flow deep into the die cavities to fill out each Nib. Keystone XL Wire does the job—uniformly, consistently and precisely.

There are many other examples of how Shakeproof puts the *flowability* qualities of Keystone XL Wire to good use, increasing production and quality. If you'd like to learn more about these qualities, call your Keystone representative. Our metallurgists are at your service.

Keystone Steel & Wire Company, Peoria 7, Illinois

Sems-by-Shakeproof—5½ diameter head plus shoulder makes this a good example of the *flowability* of Keystone XL Wire.

Mounting Screw combines left- and right-hand threads on the same shank as well as Nibs under the head. Left-hand thread and extruded lower thread section make this an exacting job.

KEYSTONE XL WIRE STUDY

KEYSTONE

WIRE FOR INDUSTRY

AMERICAN AND CANADIAN WIREMEN PREFER MICRO-WELD BUTT WELDERS

BECAUSE . . .

They mean dependable equipment. They are built to meet specific welding requirements, and are adaptable either in the mill or laboratory.

Their ease of operation is appreciated both by the operators and management.

Perfect alignment of wire ends is assured on MICRO-WELD Butt Welders.

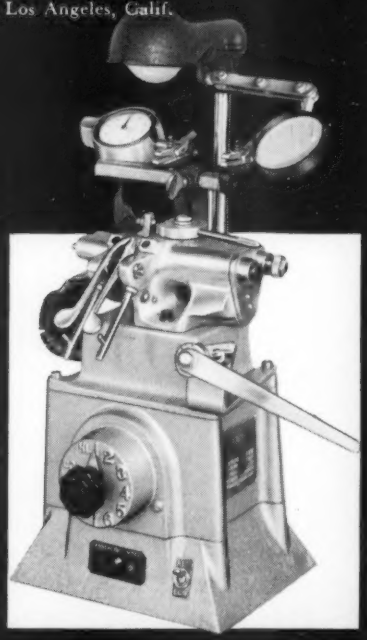
These are just a few of the users of the Model E-1-S MICRO-WELD Butt Welders in North America —

CANADA

Avro Aircraft, Toronto, Ont.
British Ropes Canadian Factory, Ltd., Vancouver, B.C.
Canada Wire & Cable Co., Leaside, Ont.
Donald Wire Rope Co., Hamilton, Ont.
B. Greening Wire Co., Hamilton, Ont.
Hamilton Wire Products Ltd., Hamilton, Ont.
National-Standard Co., Guelph, Ont.
Northern Electric Co. Ltd., Lachine, Que.
Steel Co. of Canada, Hamilton, Ont.
Wrights' Canadian Ropes, Ltd., Vancouver

U.S.A.

Columbia-Geneva Steel Co., Pittsburg, Calif.
Colorado Fuel & Iron Corp., Pueblo, Colo.
K. H. Davis Wire & Cable Corp., Los Angeles, Calif.
E. H. Edwards Co., San Francisco, Calif.
Pacific Wire Rope Co., Los Angeles, Calif.
Acme Steel & Wire Co., Chicago, Ill.
American Steel & Wire, New Haven, Conn.
Trenton, N.J.
Cleveland, Ohio
Waukegan, Ill.
Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Broderick & Bascom Co., St. Louis, Ill.
Seattle, Wash.
Peoria, Ill.
Houston, Texas
J. A. Roeblings' Sons, Trenton, N.J.



MODEL E-1-S MICRO-WELD BUTT WELDER. SUITABLE FOR BENCH MOUNTING

MICROMETER PRECISION — MICRO-WELD ®

MODEL E-1-S MICRO-WELD BUTT WELDER. MOUNTED ON 4-WHEEL TRUCK

Capacity .010" to .062" diameter high and low carbon steel wire, and alloy wire (thermocouple).

MICROMETER PRECISION — MICRO-WELD ®

MICRO PRODUCTS CO.

20 NO. WACKER DRIVE • CHICAGO 6, ILLINOIS

TELEPHONE STate 2-7468

NIEHOFF WIRE DRAWING UNITS

EXCLUSIVE REPRESENTATIVE
FOR U.S.A. AND CANADA

AMERICAN LAUBSCHER
Corporation

ISK BLDG. 250 WEST 57th STREET
NEW YORK 19, N.Y.

NIEHOFF MACHINE WORKS

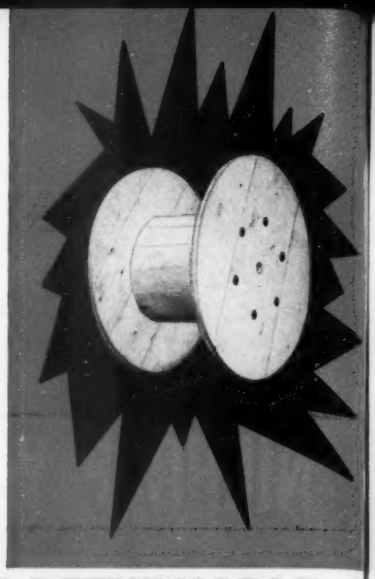
SCHWABACH NEAR NURNBERG WESTERN GERMANY

Saw mill at Bradford, N. H., where logs are processed into lumber.

HOW BRIDGE SUPPLIES ONLY THE BEST REELS

Our company is progressive. Since we began the manufacture of wood reels our plant has undergone continued expansion and improvement in production facilities.

In recent years modern affiliated companies have been established in New Hampshire to further enable us to better serve the growing needs of the wire industry.



NON-RETURNABLE

WOOD REELS IN ALL SIZES FOR ALL TYPES OF ELECTRIC WIRE AND CABLE

- Controlled saw mill work
- Air seasoning of lumber
- Conversion of stock into panels and square-edge lumber
- Maintenance of millions of board feet of lumber in inventory
- Efficient, modern material handling methods and equipment

Interior of the Kearsarge plant.

Plant of Kearsarge Reel Co. — an affiliate of Bridge Manufacturing Co.

Planing and cutting round-edge lumber prior to forming into reel head panels.

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST

Interior of Hill mill showing manufacture of panels for reel heads.

Hill Box Company's panel mill — another BRIDGE affiliate.

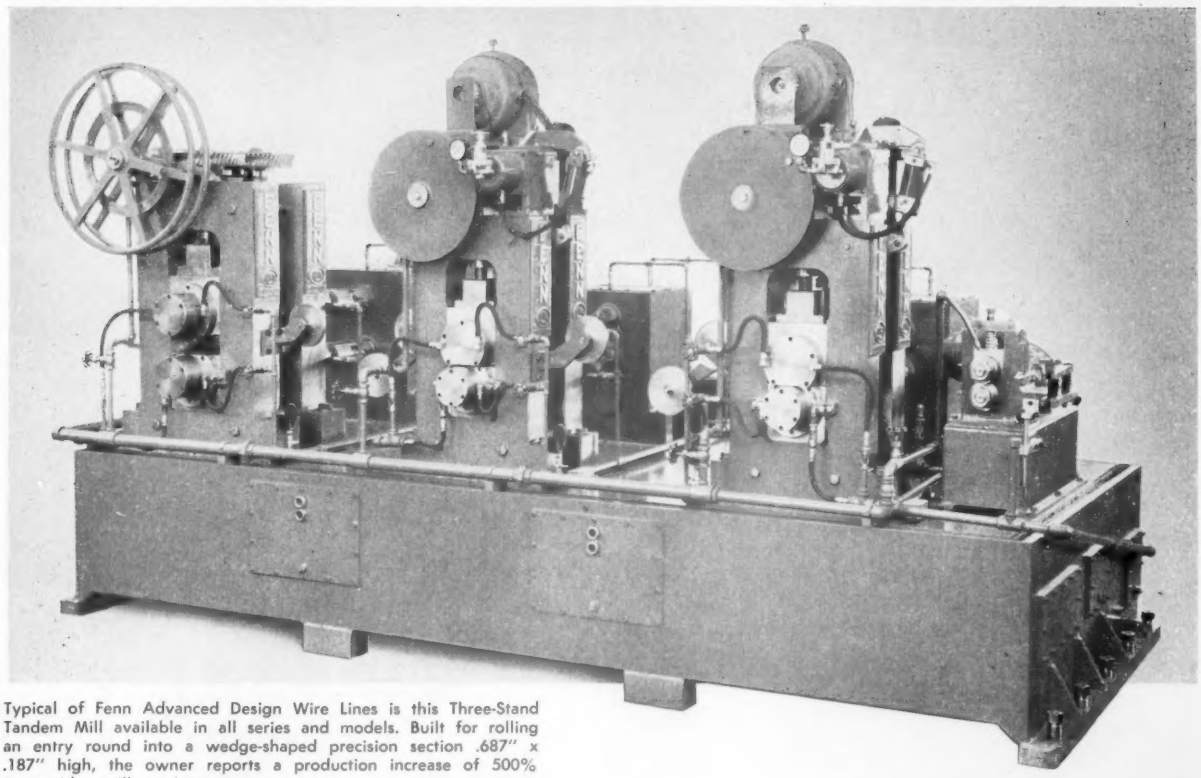
"REEL" GOOD —

Let us quote on your Reel needs. Send in your specifications. Better yet, visit our plant and see how Reels are made so well at so low a cost.

WOOD REELS"

HIGH-SPEED SHIPPING SERVICE IN OUR OWN TRUCKS WITHIN A RADIUS OF 250 MILES OF THE PLANT, FAST FREIGHT WILL BRING YOU BRIDGE REELS WITHIN A FEW DAYS TO POINTS EAST OF THE MISSISSIPPI

TEL: THOMPSONVILLE, CONN.



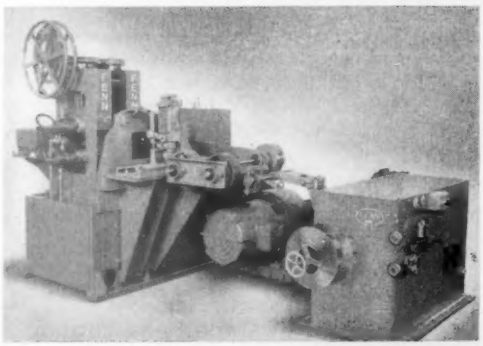
Typical of Fenn Advanced Design Wire Lines is this Three-Stand Tandem Mill available in all series and models. Built for rolling an entry round into a wedge-shaped precision section .687" x .187" high, the owner reports a production increase of 500% over older mill equipment.

Production proven

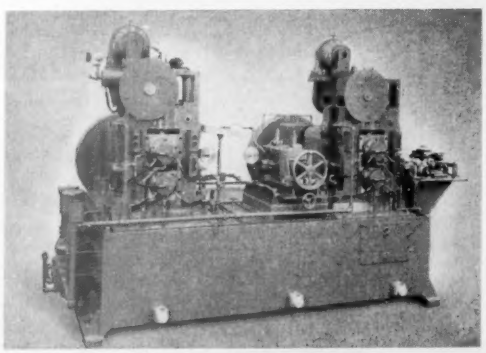
When you specify a Fenn Wire Flattening Mill . . . you can do so with confidence. Regardless of its size, number of stands and accessories, its advanced design, precision engineering and construction are all **production proven** in many installations for flattening both ferrous and nonferrous wire to exacting tolerances. Fenn can supply standard mills or lines engineered for your specific or unusual requirements. Important also to the user is Fenn's **follow-through** in your plant during and after installation. Fenn's central engineering department and a nationwide staff of factory-trained field engineers are always at your service. Write for Catalog FRM-58. The Fenn Manufacturing Company, Newington, Connecticut.

FENN

WIRE FLATTENING MILLS



The popular Fenn 5 in 1 Wire Line is **production proven** for versatility and precision. This compact mill draws, flattens, sizes and edges, sizes and shapes, gages, and bundles, yet occupies as little as 72 square feet of floor space. Costs as low as $35,000 complete. "A best buy" wherever applicable.

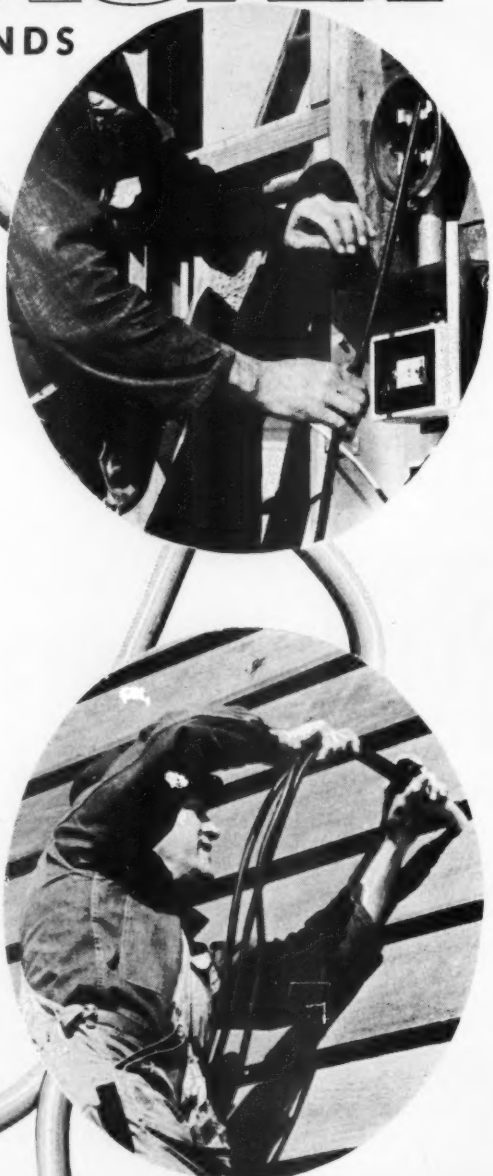


Fenn Two-Stand Tandem Wire Mill with 8" rolls. Equipped, as illustrated, with electric screwdowns, edger and magnetic continuous width and thickness gages. Rolling speeds up to 1200 fpm.

FOR QUALITY WIRE AND CABLE INSULATION & JACKETS

BLACAR®

PVC RESINS AND COMPOUNDS



Vinyl wire and cable manufacturers, in ever-increasing numbers, are turning to BLACAR for insulating and jacketing. For, BLACAR resins and compounds *meet the most rigid of quality standards for performance and uniformity* — Thus assuring maximum economy and ease of processing.

Specialists in wire and cable applications, Cary offers for your consideration:

BLACAR #250 Resin

UL approved—completely interchangeable in recognized compounds. Precisely controlled high molecular weight—low gel count, excellent dry blending and extrusion features, ensures, superior processing qualities. (Low and intermediate weight resins also available).

BLACAR COMPOUNDS (All UL approved)

#2600— An economical vinyl compound with primary applications for type T-ACT-TF-TFF wire and cable, and non-metallic inners.

#2700— General purpose vinyl compound for wide range for low-tension applications (specifically T-TW-TFF low cost building wire), including oil exposure at 60°C.

#2800— High quality vinyl compound with maximum versatility as primary insulating material. Excellent processing features electrical properties and extrusion rates —plus smooth, glossy finish. Ideal for 80°C. appliance wire and UF-NMC jackets and inners.

IF YOUR NEEDS ARE SPECIAL — Cary can modify existing products or custom-formulate to the most exacting requirements.

TECHNICAL ASSISTANCE — DATA — WORKING SAMPLES — FURNISHED ON REQUEST. FIND OUT WHAT "CARY SERVICE" REALLY MEANS TO YOU!

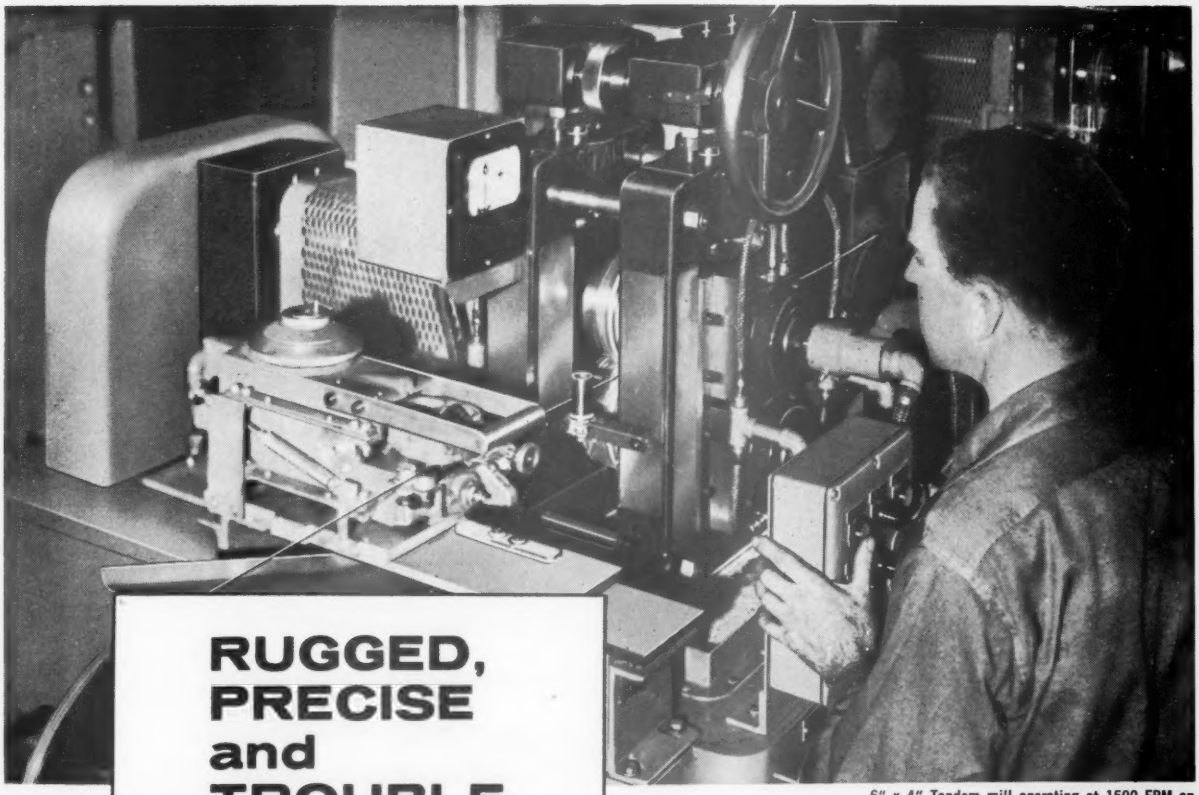
CARY CHEMICALS INC.

CARY CHEMICALS INC.

Mail address: **P.O. BOX 1128, NEW BRUNSWICK, N. J.**

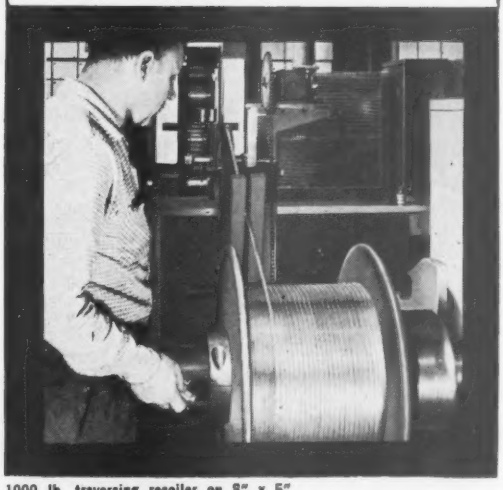
Plants at: East Brunswick and Flemington, N. J.

VINYL RESINS — VINYL COPOLYMERS — VINYL COMPOUNDS — SPECIALTY WAXES — HIGH MELTING POINT SYNTHETIC WAXES



6" x 4" Tandem mill operating at 1500 FPM on high carbon steel at Page Steel Division—ACCO.

RUGGED, PRECISE and TROUBLE FREE



1000 lb. traversing recoiler on 8" x 5" tandem line at Kagan Dixon Wire Corp.

STANAT WIRE FLATTENING MILLS

Stanat mills are designed to consistently give you extremely close tolerances combined with high speed production.

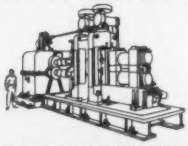
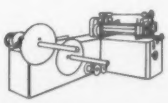
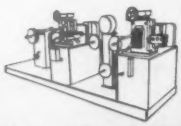
Simplicity of design insures minimum maintenance and frequently permits one man operation.

All Stanat mills include such quality features as completely enclosed permanently lubricated worm gear screwdowns; fully adjustable traversing recoiler; herringbone drive; anti-friction bearings at all critical wear points.

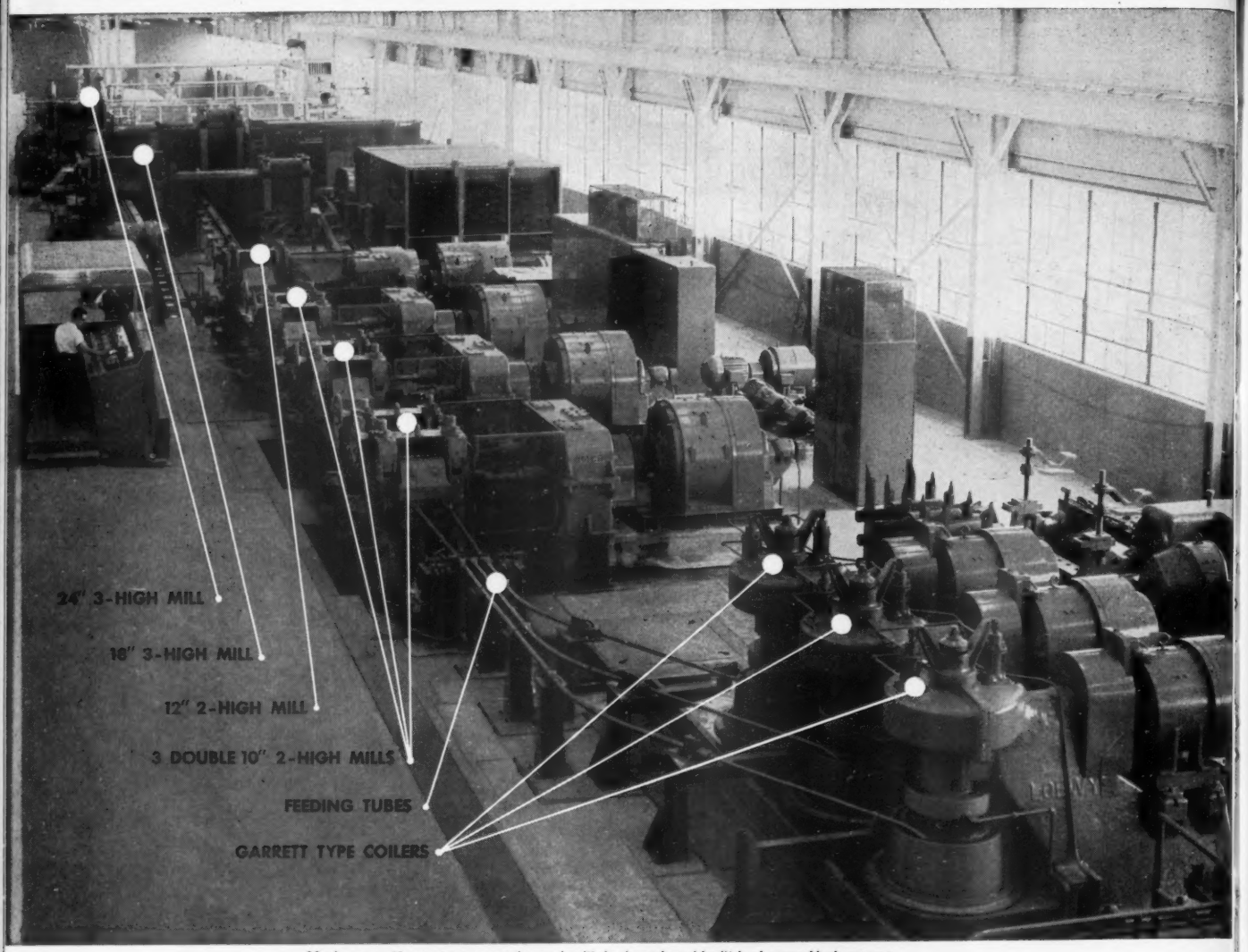
Stanat single and tandem wire flattening mills are available in sizes up to 10" roll diameter either as completely self-contained package units or as individual components for erection at your plant.

STANAT
MANUFACTURING CO., INC.

500 SHAMES DRIVE WESTBURY, L. I., N.Y.
IN EUROPE: STANAT-MANN, ESSEX, ENGLAND

MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS



Modern continuous copper wire rod mill designed and built by Loewy-Hydropress.

LOEWY wire rod mills reduce wire bars to 5/16 in. wire rod automatically

This Loewy copper wire rod mill, which has been in successful operation for 2 years, rolls 5/16 in. wire rod from standard wire bars in a continuous operation. It is fully automated and all phases are controlled from one pulpit.

In addition to excellence of product, the owner is extremely pleased over the fact that, due to automatic operation, this installation permitted him to start operations with an inexperienced crew.

Whether you are a user or producer of wire rod, your competitive situation probably calls for equipment which functions flawlessly and with minimum personnel. Careful economic study might well reveal that the installation of a wire rod mill would be highly profitable for you.

Consult us—without obligation—on a mill which will answer your individual requirements for wire rod. Write Dept. I-1

Loewy-Hydropress Division

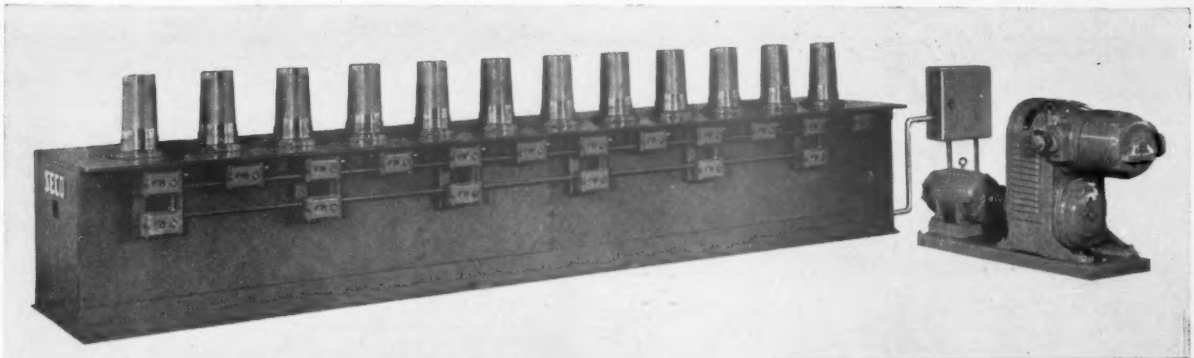
BALDWIN · LIMA · HAMILTON

111 FIFTH AVENUE, NEW YORK 3, N.Y. Rolling mills • Hydraulic machinery • Industrial engineering

BALDWIN BLH LIMA-HAMILTON

SECO Fine wire TAKE-UP FRAMES

The "last-word" in wire-winding efficiency!



- **Simplified Design and Construction**
- **Synchronized Electrical Variable Speed**
- **Noiseless, Vibrationless Running**
- **Greatly Increased Operating Capacity**

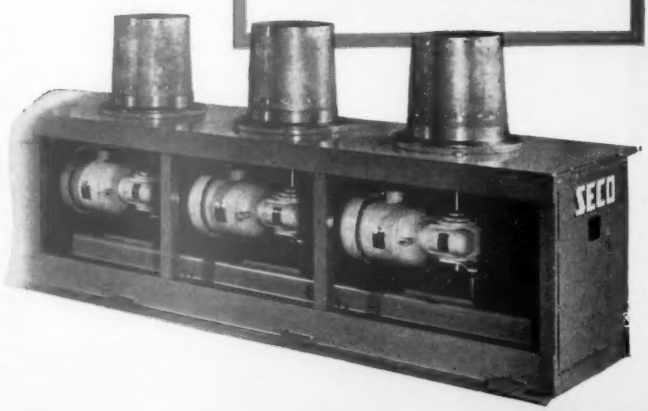
SECO builds take-up frames for handling fine gauge steel or non-ferrous wire on 8", 12", or 16" diameter blocks...with linear wire speeds up to 1,000 FPM or higher. Superior features include a multiple electrical drive system (alternating current) for synchronized electrical transmission of variable speed power.

This gives simultaneous speed changes to all spindle blocks, in ratios up to 5:1 or even 10:1 or higher. It provides push-button stop-start control to each of the gear motors driving each spindle block. Gone is the old bevel gearing, with manually operated clutches for starting and stopping the blocks.

SECO high production take-up frames are constructed to accommodate any number of spindles required. Frames with horizontal spindles can also be built. Call or write for complete information and data. Consultation invited—no obligation.

SHOWN ABOVE:
SECO Take-Up Frame and VARIDYNE Electrical Power Unit which provides synchronized variable speed to the multiple drives. AC current is employed throughout, and the VARIDYNE System "gears" all the drives together by electrical impulses.

SHOWN BELOW:
The AC squirrel-cage induction type gear motors which drive the spindle blocks through hollow bored shafts.



STEEL EQUIPMENT COMPANY
P. O. BOX 737, WARRENSVILLE STATION
CLEVELAND 22, OHIO

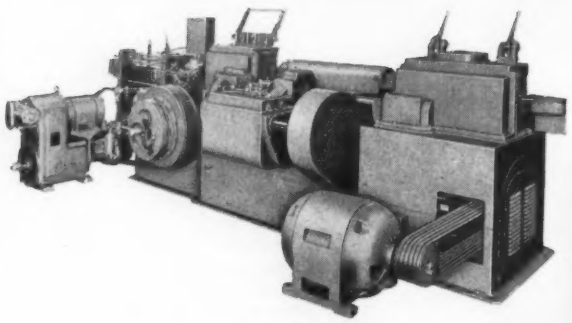
SECO

Meet your Profit Challenge with LEWIS Wire Straightening and Cutting Machines

There is a Lewis machine for every possible purpose in the wire straightening and cutting field. And Lewis engineers are constantly working on new designs and developments to further improve performance. There are 46 models in the Lewis line.

Lewis machines are designed to do the highest quality job of wire straightening and cutting in rounds as well as shapes.
For speed, accuracy and clean cutting, they have no equal anywhere.

In every possible way, Lewis Machines meet the challenge of today's production requirements.

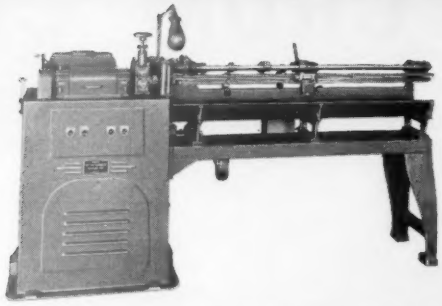


Lewis No. 11-FA Travel-Cut with Flying-Shear Cut-Off. Capacity ½" to ¾" diameter, 75-175 FPM. Rear view with guards removed showing Air Clutch and drive.

The combination of Air Brake, Air Clutch and Variable Speed Drive permits higher cut-off speeds... and allows infinite adjustment of the flywheel for perfect synchronization of cut-off and wire feed speeds... rod can be cut WITHOUT SPOT SWELL.

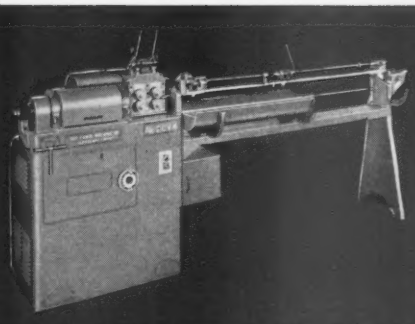
N. B.

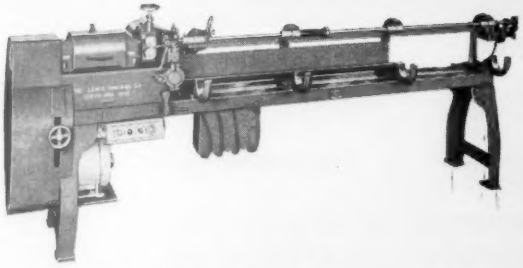
TIMKEN Tapered Roller BEARING EQUIPPED



Lewis No. "O" Electric-Air. Especially designed for straightening and cutting fine wire sizes. Capacity .012" minimum to .0625" music wire, .072" spring wire, .080" basic wire.

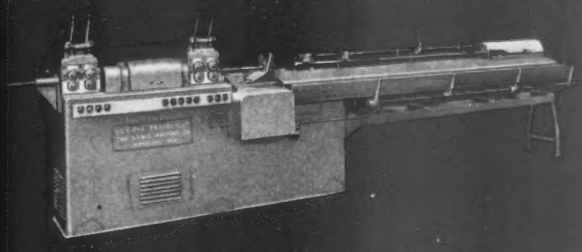
Extremely fast air-operated cut-off eliminates Flywheel and Clutch...Variable Speed Drive provides wire feed range of 15-90 FPM ... precision length gauging, plus or minus .0025 in 6" length ... highest quality finish.





Lewis No. 1-C Automatic Wire Straightening and Cutting Machine. 1/16" to 1/8" capacity.

Greater flexibility with Multiple Speed Drive in a low cost machine. High-speed Five-Die Rotary Straightener Arbor, mounted on ball bearings. Available with super-sensitive electric trip mechanism.

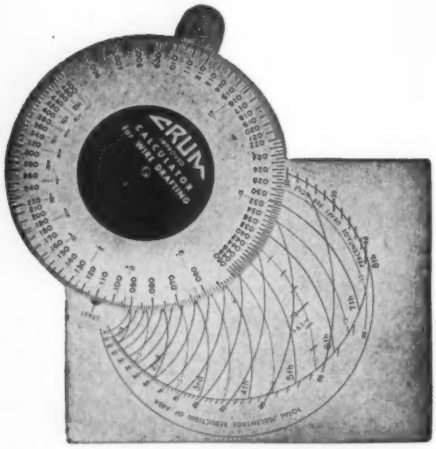


LEWIS

SAVE SET-UP TIME WITH THE...

CRUM CALCULATOR
FOR WIRE DRAFTING

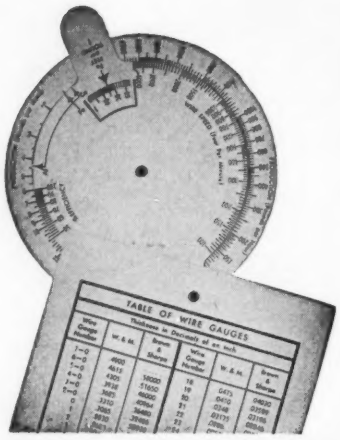
Useful and Accurate!



Front view of Crum Calculator

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. **Provide quicker and more accurate information on die sizes and reduction areas;**
2. **Calculate wire production rates for various speeds and efficiencies.**



Reverse view of Crum Calculator

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving—no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

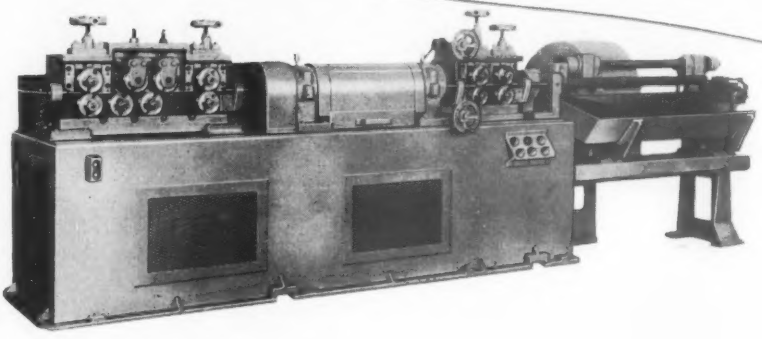
WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

SHUSTER®

Wire Straightening and Cutting Machines your BEST BUY!



Illustrated **MODEL 4AV**
$\frac{3}{8}$" to $\frac{11}{16}$" basic wire.
feeds from 90 to 180
feet per minute.

MODEL 3AV
$\frac{1}{4}$" to $\frac{1}{2}$" basic wire,
feeds from 76 to 228
feet per minute.

MATERIAL: Wire in coils purchased at lowest price.

STORAGE: Less floor space required than for storage of straightened and cut lengths.

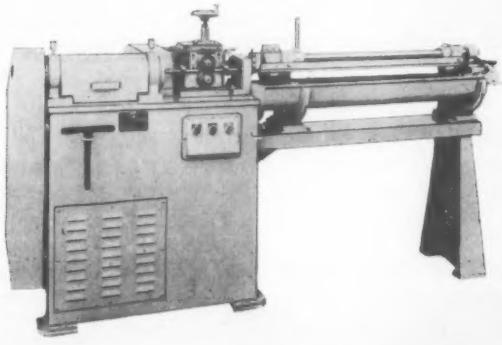
DELIVERY: *When* you *need* it. Eliminates damaged wire waste.

COST: SHUSTER is the oldest (1866), most dependable name in wire straightening and cutting. Always ahead with the best, *tested* machine refinements, SHUSTERS cost *less* than any comparable machine.

SHUSTER

Wire Straightening and Cut-off Machines and Components are built in 49 models from .020" to 11/16" Mettler Machine Tool also manufactures the SHUSTER 5/16" capacity. Thread Rolling Machines

SINCE 1866



Illustrated here is NEW SHUSTER Model 1AVS 3/16" and 1/4" Capacity WIRE STRAIGHTENING & CUTTING MACHINE.

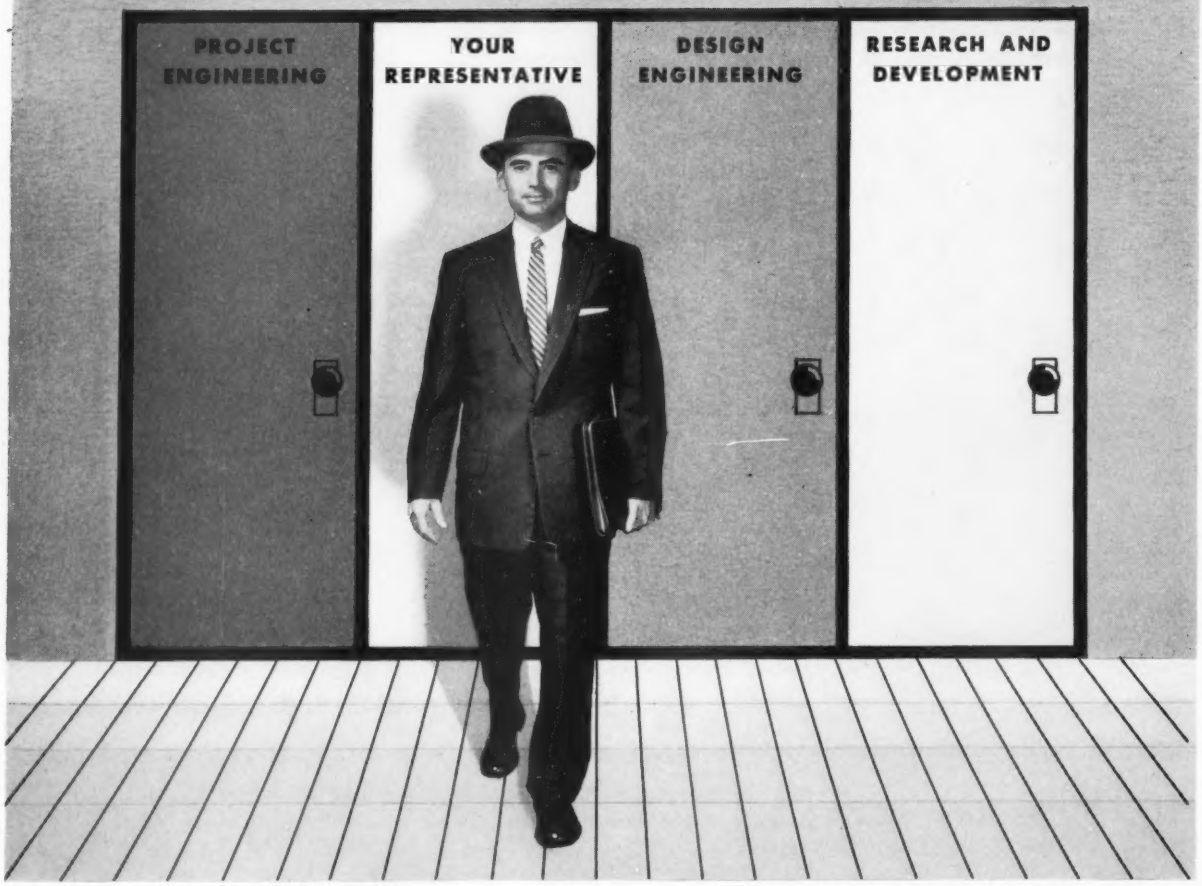
CAPACITIES 1AVS—5

.062" to .250" basic wire
.062" to .148" spring wire
50 to 200 F.P.M.

METTLER MACHINE TOOL, INC.

155 W. Adeline, New Haven, Connecticut

Your Key to *Sunbeam* Services...



...Your *Sunbeam* Furnace Representative

BEHIND HIM ARE A TEAM OF EXPERTS—The entire Sunbeam organization of engineers and service personnel. It's made up of:

PROJECT ENGINEERING MEN—Who understand and solve customers' application problems, coordinate quotations and answer inquiries promptly.

DESIGN ENGINEERING MEN—Who design the right combination of cost and quality into your furnace equipment.

RESEARCH AND DEVELOPMENT MEN—Who create new furnaces that offer better performance, longer life at a lower cost.

And don't forget—you can buy *all of your furnace equipment from Sunbeam*—furnaces, generators, control panels, material handling and quenching equipment . . . pre-tested, piped and wired and ready to go to work.

Let your Sunbeam representative put the right experts from his service team to work on *your* requirements.

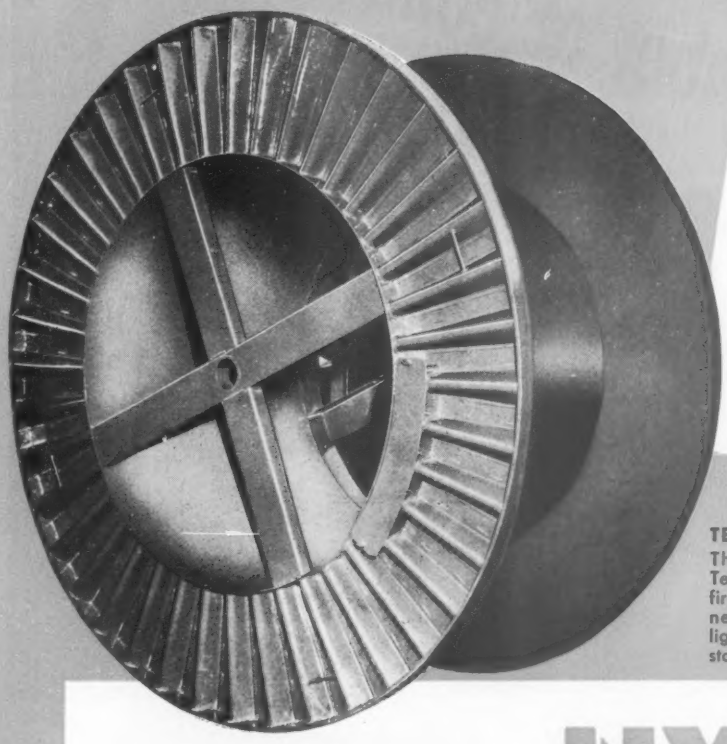
Write or call for the name of the Sunbeam representative nearest you.

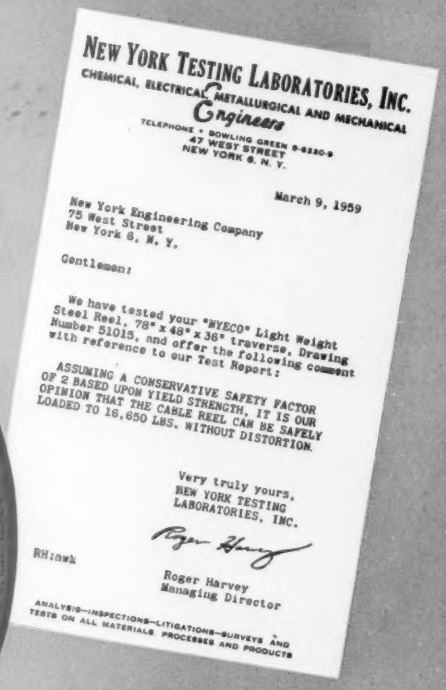
Sunbeam

SUNBEAM EQUIPMENT CORPORATION

196 Mercer Street, Meadville, Pennsylvania

Proven By Actual Test!





NEW YORK TESTING LABORATORIES, INC.
CHEMICAL, ELECTRICAL, METALLURGICAL AND MECHANICAL
Engineers
TELEPHONE • BOWLING GREEN 9-8380-9
67 WEST STREET
NEW YORK 6, N. Y.

March 9, 1959

New York Engineering Company
75 West Street
New York 6, N. Y.

Gentlemen:

We have tested your "NYECO" Light Weight Steel Reel, 78" x 48" x 36" traverse, Drawing Number 51015, and offer the following comment with reference to our Test Report:

ASSUMING A CONSERVATIVE SAFETY FACTOR OF 2 BASED UPON YIELD STRENGTH, IT IS OUR OPINION THAT THE CABLE REEL CAN BE SAFELY LOADED TO 16,650 LBS. WITHOUT DISTORTION.

Very truly yours,
NEW YORK TESTING
LABORATORIES, INC.

RHiawk

Roger Harvey
Managing Director

ANALYSIS—INSPECTIONS—LITIGATIONS—SURVEYS AND TESTS ON ALL MATERIALS, PROCESSES AND PRODUCTS

TESTED AND APPROVED!
This letter from New York Testing Laboratories, Inc. confirms the superiority of the new NYECO smooth-faced, light weight steel reel over standard reels.

ANNOUNCING THE NEW NYECO

SMOOTH-FACED LIGHT WEIGHT STEEL REEL

NOW AVAILABLE FROM NYECO . . .

greater protection against damage in shipping and processing with this rugged, weather-resistant, warp-proof, NYECO Steel Shipping Reel. All reels are furnished with four cross-arms unless otherwise specified. Drive-holes optional. No die charges or extras . . . any drum diameters or traverse. Flange diameters 42" to 90" inclusive.

NYECO ALSO MANUFACTURES

- Impregnating Tanks
- Vulcanizers
- Floor Rolls
- Pressure Vessels

YOUR INQUIRIES WILL RECEIVE OUR PROMPT ATTENTION

Send specifications for STEEL SHIPPING REELS, IMPREGNATING REELS, PROCESSING REELS, SUBMARINE CABLE REELS AND BRIDGE REELS. Prompt deliveries on large or small orders.

ANY QUANTITY—ANY SIZE—
ANY LOAD FLANGE DIAMETER
from 42" up

Specialists to the wire industries for over 50 years.

NYECO

NEW YORK ENGINEERING COMPANY

75 WEST STREET • NEW YORK 6, N. Y.

TELEPHONE: WHitehall 4-5380 • CABLE: NYECO, N. Y. • PLANTS: YONKERS, N. Y.

NOW! at low cost twist any number of conductors to make cable up to 1" diameter

only the COOK MULTIPLE INSULATED WIRE TWISTER provides such flexibility

Here's a twister that offers the flexibility required of today's wire mills manufacturing insulated cables. It's truly flexible . . . you can make any cables required up to 1" diameter.

And, because the COOK MULTIPLE INSULATED WIRE TWISTER is so low in cost, it is the practical addition to your plant. Compare it with any other machine on the market doing this work . . . compare its performance . . . compare its cost . . . compare its construction. Why not see for yourself . . . write for complete specifications and prices today.

SPECIFICATIONS

Production	9,000 ft/hr at 7½" lay
Reel Size	30" std. also from 16-36" dia.
Floor Space	6 ft. x 8 ft. max.
Lay Range	¾" to 7½"
Twist	Right or left hand
Finished Wire Size	Up to 1" dia.
Wrapping Head	Optional
Neutralizer	Optional

COOK
MANUFACTURING CO.
50 EAST 25th STREET, PATERSON, N. J. • ARMORY 4-6380

•

CANADIAN AGENT:
E. V. LARSON CO., LTD., TORONTO, CANADA

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EUROPEAN AGENTS:
CAPAMADJIAN LE MONNIER CIE LTD., PARIS, FRANCE
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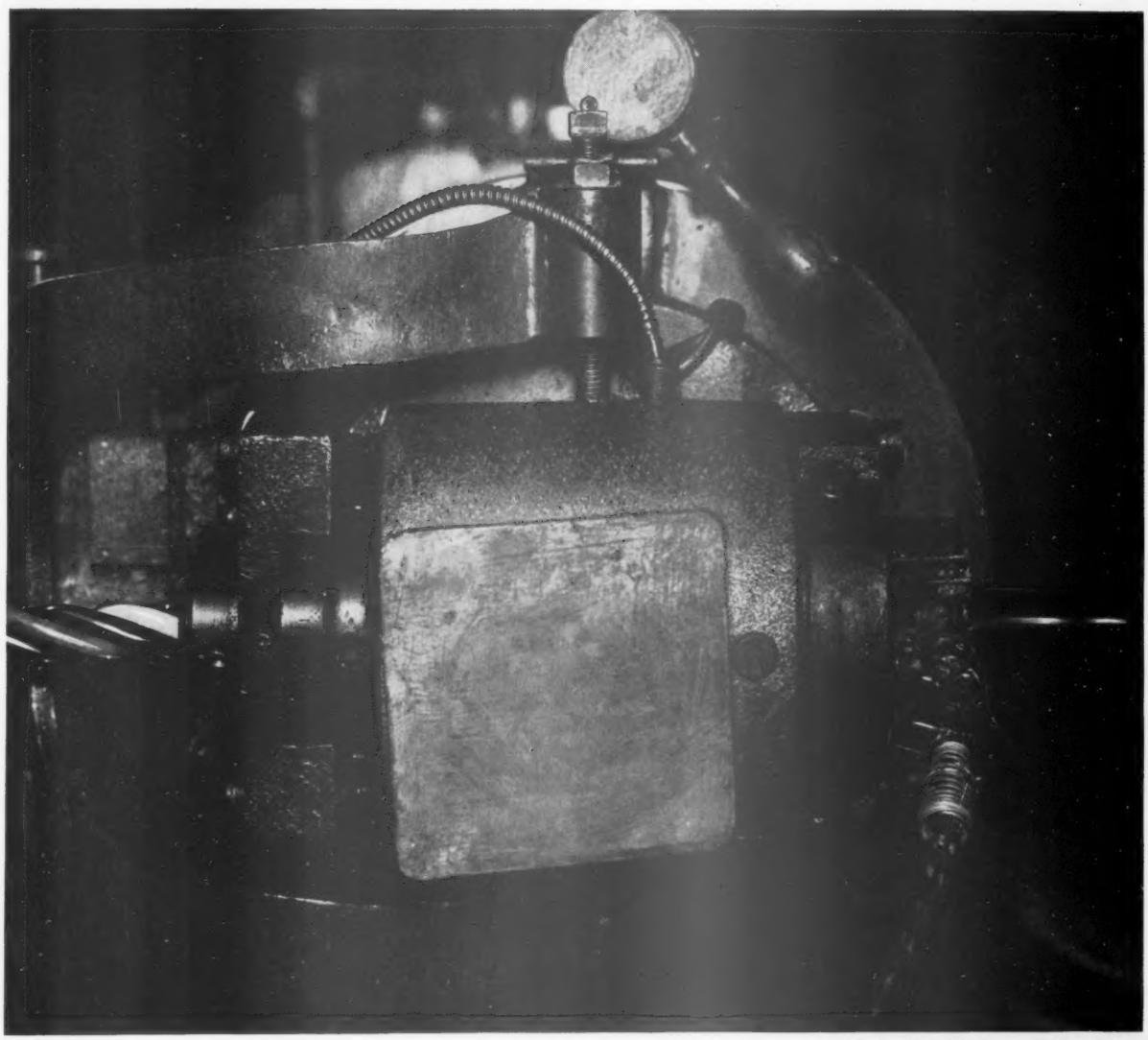

Photo courtesy Ideal Wire Products Co., Lowell, Mass.

Need a quality resin accepted and approved for electrical applications?

VYGEN 120 PVC resin is UL-approved as interchangeable with other quality PVC resins for wire insulating applications. VYGEN 120 is specially formulated for fast economical dry-blend extruding, with monomeric or polymeric plasticizers. It assures a lack of gelled particles . . . provides excellent heat and light stability plus exceptionally long life. See how VYGEN can help your products . . . speed your production . . . send for complete technical literature today!

VYGEN®

VYGEN 6812 COMPOUND
UL-approved for UF-NMC cable. Type T, TW, 60°C Oil, and 80°C appliance wire applications. May also be used as primary insulation for other cable constructions and jacketing.

VYGEN 6035 COMPOUND
UL-approved for Type T, TW, and exposure to oil use at 60°C. This compound combines excellent physical and electrical properties with very good weather and flame resistance.

VYGEN 9221 COMPOUND
Meets UL requirements for 90 and 105°C applications. Recommended for appliance, radio hook-up, machinery wire etc. where heat resistance and good physical properties are required.

Creating Progress Through Chemistry

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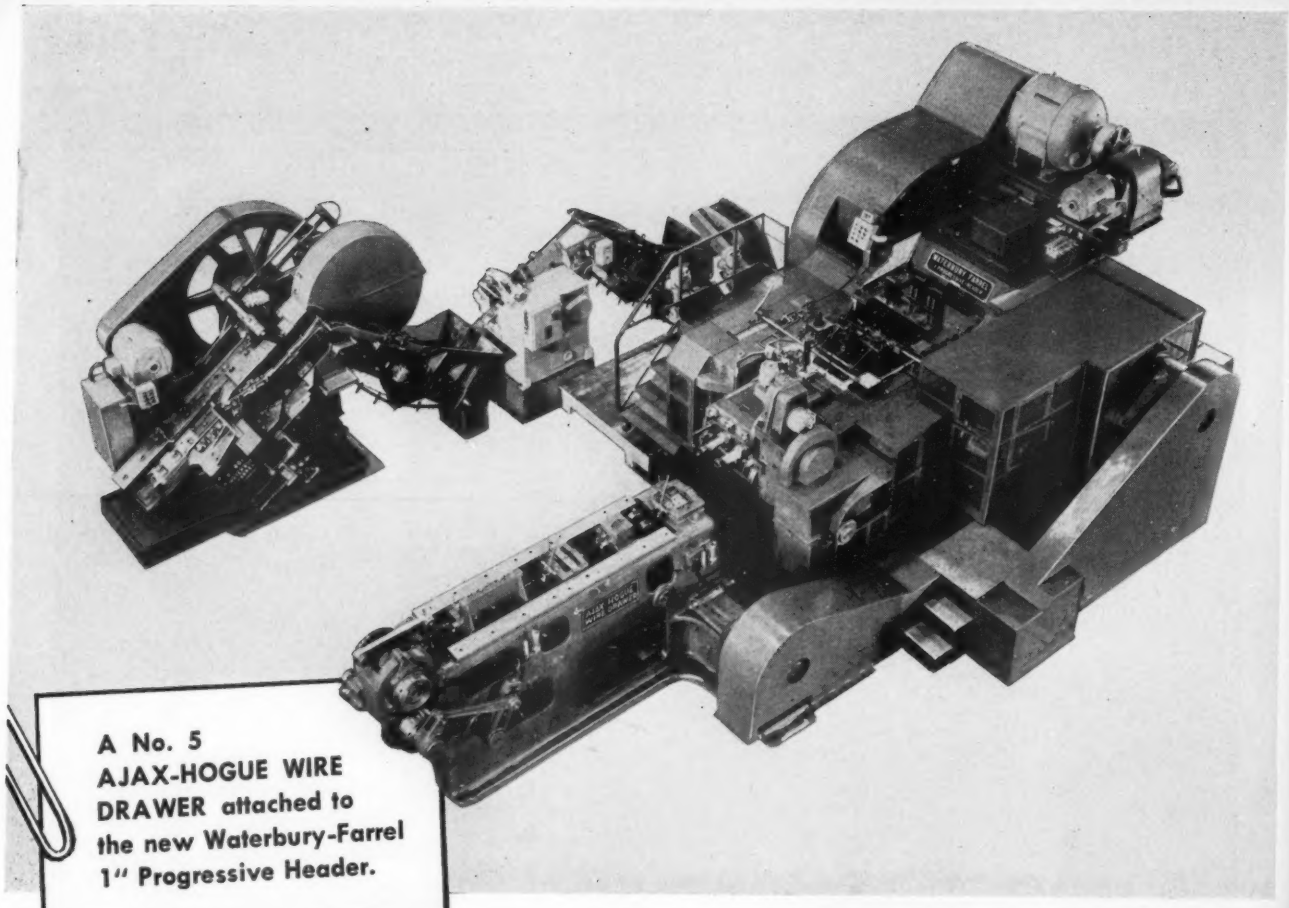
THE GENERAL TIRE & RUBBER COMPANY
Chemical Division · Akron, Ohio

Chemicals for the rubber, paint, paper, textile, plastics and other industries: **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins and compounds* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*



A No. 5 AJAX-HOGUE WIRE DRAWER attached to the new Waterbury-Farrel 1" Progressive Header.

For Quality Production at Lower Cost COLD HEADERS Need . . .

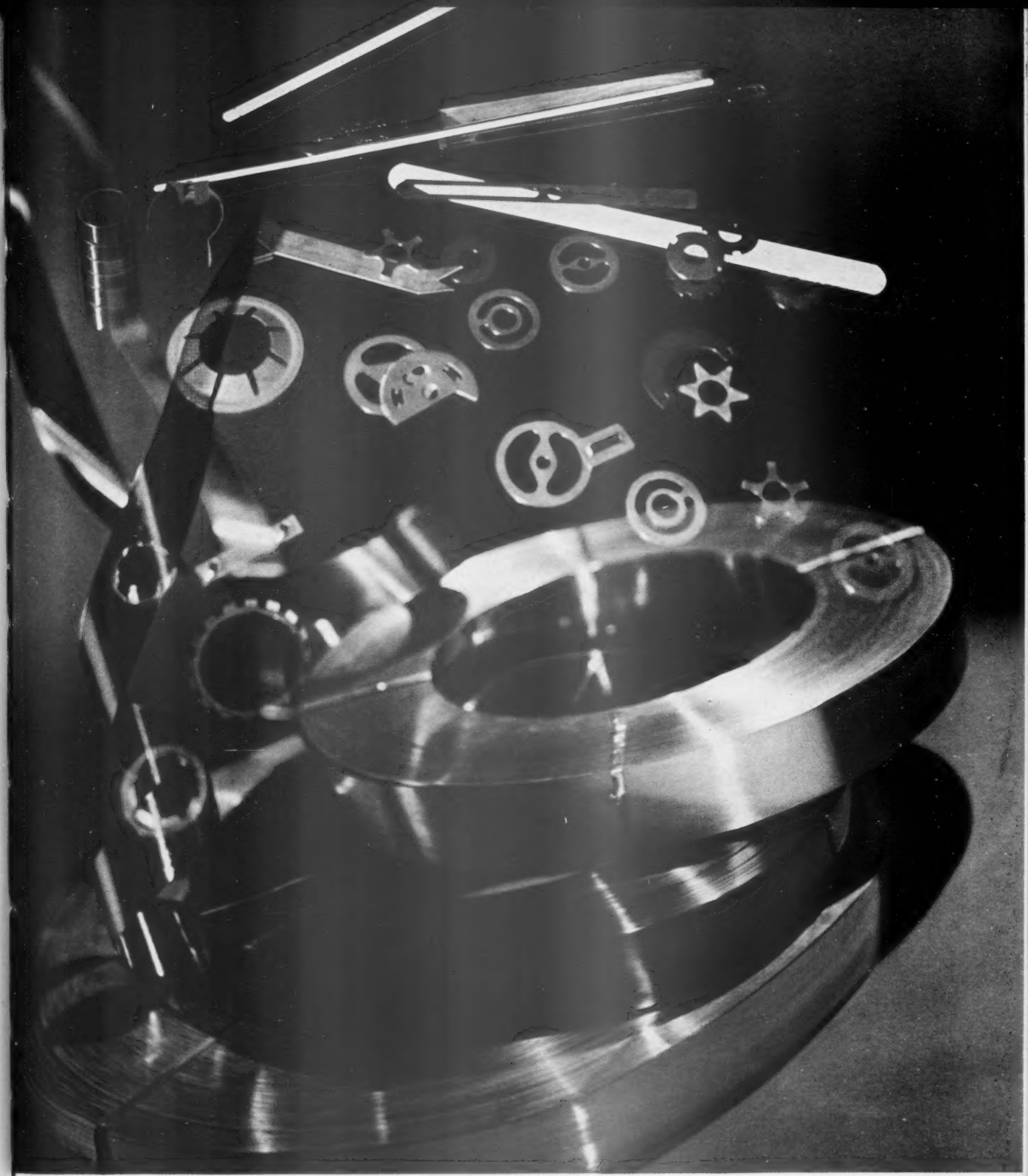
AJAX-HOGUE Wire Drawers

AN ATTACHMENT FOR HEADERS AND COLD NUT FORMERS

THE AJAX-HOGUE WIRE DRAWER is a complete wire drawing unit, custom designed to fit any make cold header or cold nut former. It cold draws wire in a straight line and coats wire from hot-rolled, pickled and limed rod as it feeds into the header. You are sure of uniformly accurate size wire from successive coils. A wire drawer attached to your header assures easier heading, improved products and increased production. *Write for Bulletin 111-A.*

DESIGNED AND BUILT BY

THE Ajax MANUFACTURING COMPANY
1441 CHARDON RD. CLEVELAND 17, OHIO
CHICAGO OFFICE: 110 S. DEARBORN ST., CHICAGO 3, ILLINOIS
WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



Quality in Ascendancy

The superiority of the vast number of products that are — and can be made from Roebling Cold Rolled Flat Spring Steel is a fact known throughout all industry.

You pay for mechanical and dimensional uniformity when you buy flat spring steel . . . you get it when you buy Roebling.

For information on how our products can help yours, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
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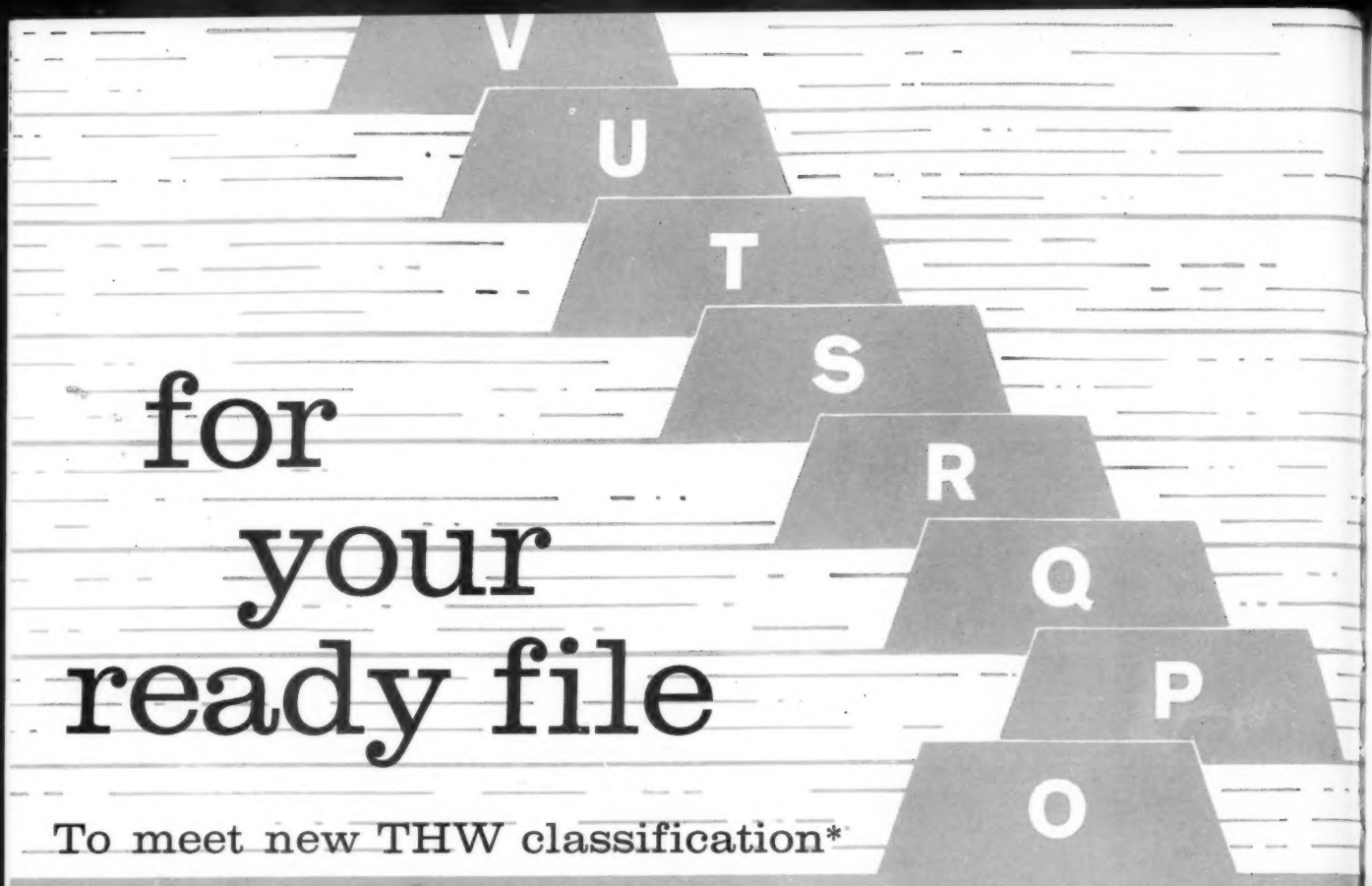
Roebling... Your Product is Better for it



for your ready file

To meet new THW classification*

Monsanto OPALON 71345 vinyl compound

PHYSICAL PROPERTIES	UL SPECIFICATIONS FOR THW	TYPICAL TEST VALUES FOR OPALON 71345 (#14 AWG solid wire with 3/64" insulation)
1) Tensile Strength, psi	2000 min.	2550
% Retention (aged 7 days @ 121°C)	75 min.	105
2) Elongation,	150 min.	295
% Retention (aged 7 days @ 121°C)	50 min.	86
3) Deformation, T_2/T_1 (1 hr. @ 121°C, 500 gm. wt)	0.70	0.88
4) Vertical Flame Test	Pass	Passes
5) Heat Shock Test, 121°C.	Pass	Passes
6) Mechanical Water Absorption mg/in^2	20 max.	14-16

ELECTRICAL PROPERTIES	UL SPECIFICATIONS	OPALON 71345
1) Specific Inductive Capacitance		
1000 cycles at 75°C.	10 max.	7.4
1 day	5 max.	2.3
% change 7-14 days	10 max.	7.2
2) Insulation Resistance megohms/1000 ft.		
1 day at 15.6°C.	150 min.	4200
1 day at 75°C.	0.1 min.	6.1
1 week at 75°C.		4.8
10 weeks at 75°C.		5.5
28 weeks at 75°C.		5.6
3) Conductor Corrosion	None	None
4) Dielectric Strength, volts	3000	over 20,000
1 day at 15,6°C.		

(1959 edition of the National Electrical Code of the National Fire Protection Association)

*Under the new THW classification, up to 20% more current can be run through conductors than could be with TW conductors. Smaller conductors can be used, saving conduit space, cutting wiring costs. Maximum operating temperatures raised from 60° to 75° C. Good electrical properties, moisture and heat resistance, aging characteristics, economical performance, processability and freedom from conductor corrosion, make Opalon 71345 ideally suited for THW usage. For complete technical and processing data on Opalon 71345 write to Monsanto Chemical Company, Plastics Division, Springfield 2, Massachusetts.

OPALON REG. U. S. PAT. OFF.

Monsanto

MONSANTO DEVELOPER IN **PLASTICS**

Vertical Continuous Vulcanizing

. . . a totally new concept in wire insulation

ANNOUNCEMENT TO THE INDUSTRY

Problems of transformation, scuffing, flattening and scoring in the curing of thick, spongy insulation have been eliminated by Vertical CV. Already in commercial use, Davis-Standard Vertical CV machinery delivers cable insulation of better concentricity, more uniform diameter and improved values in dielectric strength and corona level tests.

There are numerous advantages to drawing the insulated wire downward through the vulcanizing tube:

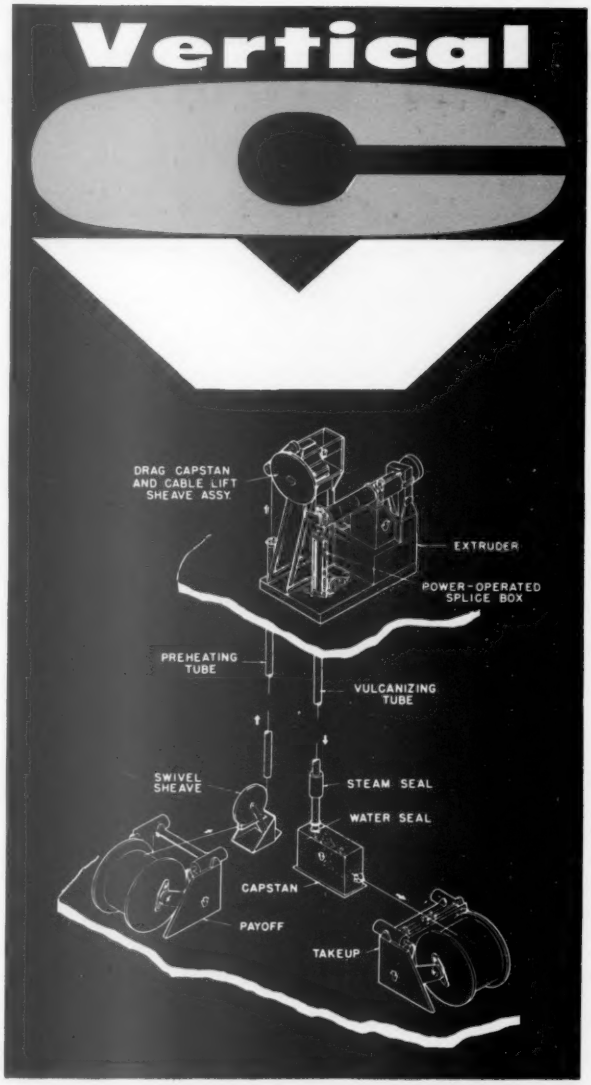
The easily damaged, uncured insulation does not come in contact with the vulcanizing tube until it has been vulcanized by steam and water.

The Drag Capstan, located above the Extruder, can be used to retract wire from the vulcanizing tube.

Vertical CV does not require the valuable floor space occupied by the conventional horizontal vulcanizing process.

Pay-Off, Capstan and Take-Up machinery are located on one floor for convenient reel-handling and operating adjustments.

The desirable feature of pre-heating the wire can be readily accomplished as it travels upward to the extruder.



We are prepared to discuss the application of Davis-Standard's Vertical CV machinery to your wire insulating line.

DAVIS-STANDARD

Division of FRANKLIN RESEARCH CORPORATION

14 WATER STREET, MYSTIC, CONNECTICUT

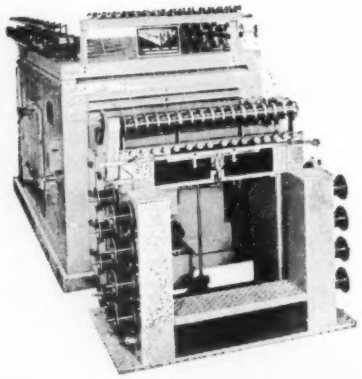
MIDWEST - C. J. Beringer Co., 5667 Milwaukee Ave., Chicago 46, Illinois. WEST COAST - C-L Chemical Products Co., P. O. Box 3043, Santa Ana, California.
EUROPE and the STERLING AREA - Fawcett, Preston & Co., Ltd., Bromborough, England.

MICHIGAN OVEN COMPANY
DETROIT, MICHIGAN
MOCO

WIRE ENAMELLING EQUIPMENT

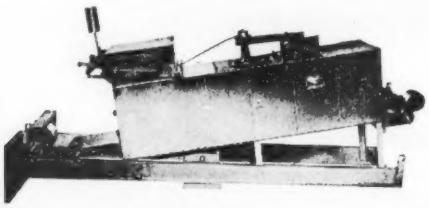
now to be manufactured by

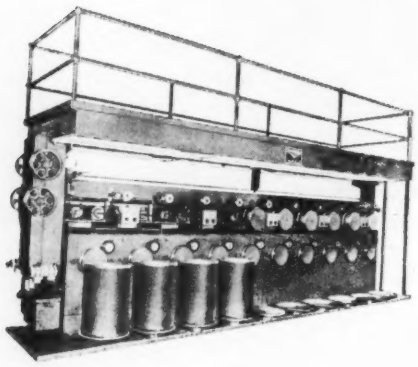
GENERAL
GENERAL ENGINEERING CO (RADCLIFFE) LTD



Due to a recent manufacturing agreement between the two companies, General Engineering Co. (Radcliffe) Ltd., have now extended their range of wire and cable equipment to include the full complement of equipment for the enamelling of wire.

The advertisement shows only three items, but your enquiries on any wire enamelling equipment would be welcomed.





1) FINE WIRE ENAMELLING MACHINE

This type "B" machine handles wire from 31 A.W.G. to 42 A.W.G. Five other models complete the range from the finest wire to large rectangles. The horizontal, high volumetric, recirculating double-pass oven allows greatly increased production by rapid heat impartation and a high degree of temperature uniformity.

2) SELF GENERATING ATMOSPHERE ANNEALERS

This is a gas-fired annealer using the heating equipment as an internal inert atmosphere generator. Advanced mixing and burning equipments are utilized which exclude the need for external sources of steam or costly inert atmospheres. Available in horizontal or vertical mounting positions.

3) UNIVERSAL REEL OR DRUM PACKER

This equipment permits packaging of wire on 6" or 12" diameter spools or in 100 lb. capacity pails or 500 lb. capacity barrels. Packaging arrangements are optional from spindle to spindle without machine alteration.

GENERAL ENGINEERING CO (RADCLIFFE) LTD

Bury Road Radcliffe Lancashire England

Telephone: Radcliffe 2291
Telegrams: "General", Radcliffe, Manchester.

Canadian Agents: H. J. R. Court, Box 588, Georgetown, Ontario, Canada.

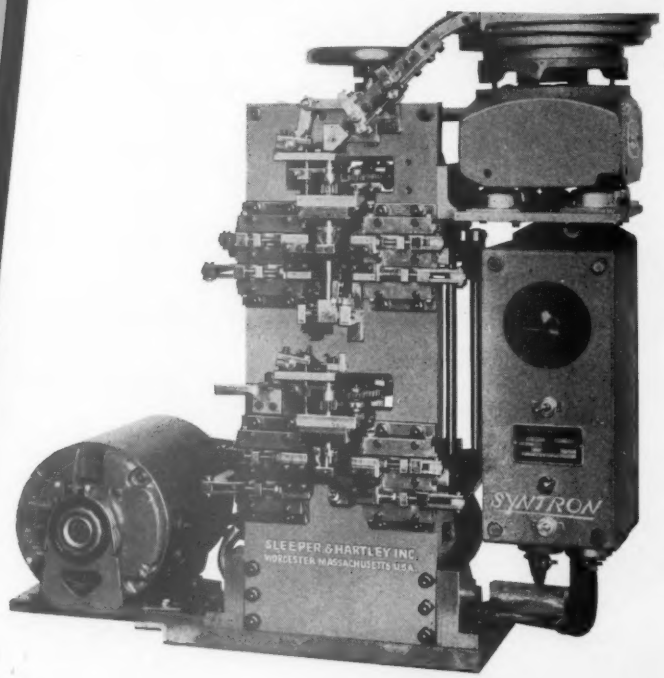
American Agents: Wire Equipment Division, Michigan Oven Company, 415, Brainard, Detroit 1, Michigan

A NEW MACHINE THAT PAYS FOR ITSELF IN SIX MONTHS . . .

NEW
S & H #0
AUTOMATIC
SPRING LOOPER
Series #750

Here is the most revolutionary designed looping machine to hit the spring industry in years. It enables you to loop your extension springs five to six times faster than with conventional methods. Hopper fed, it loops both ends of extension springs in one operation.

Time consuming set-up procedures, usually encountered with Automatic Coiling-Looping Combinations are eliminated, saving time, labor and money. Length Range — ¼" to 1½"; Max. O.D. — .200; Wire Range — .010 to .025; Production — 3000 springs per hr.



Write for further information

SLEEPER & HARTLEY INC.
335 CHANDLER STREET
WORCESTER 1, MASS., U.S.A.
ORIGINAL MANUFACTURERS OF UNIVERSAL SPRING COILERS

Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

HARTFORD DETROIT CHICAGO

NATIONAL MACHINERY CO.

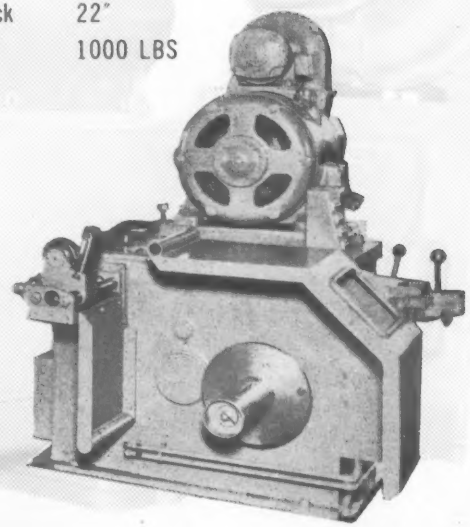
TIFFIN, OHIO, U. S. A.

ROD BREAKDOWN MACHINE

Specification

Entry size	3/8″, 5/16″ Soft copper rod.
Finished size	No. 6 to No. 14 B & S(4.0m/m 1.6m/m)
Finishing speed	1500 to 4000 F.P.M. 6 change.
Number of dies	11
Diameter of capstan	14″ 6-tandem
	18″/11.6″ 2-cone tandem
Motor size	250 HP
Diameter of coiler block	22″
Max. Spool capacity	1000 LBS

MODEL AH-11



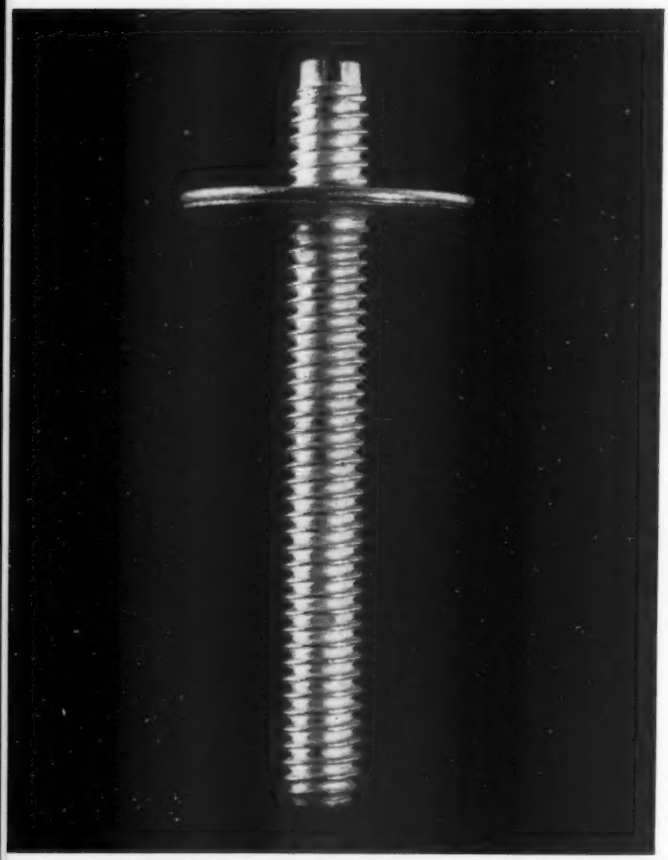
4000 FPM at BS #12

SHOWA MACHINE WORKS LTD.

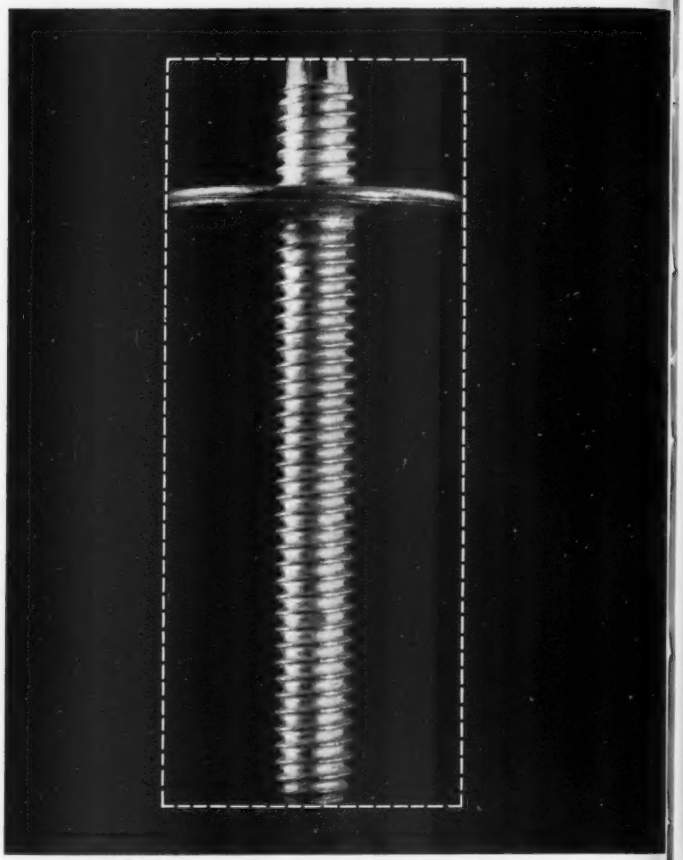
No. 16, Naka 3-chome, Mitezima, Nishi-Yodogawaku, OSAKA, JAPAN. Tel. (47) 3051

SHOWA

This "impossible" screw is now being cold-headed



Now cold-headed from steel wire at one-tenth the cost.



Machined from bars, 91 pct of the steel is wasted.

This automobile window-adjusting channel screw is being produced from cold-heading wire at one-tenth the original cost. Formerly machined from bar stock with a 91 per cent waste, this special screw is upset to three-and-one-half times the diameter of its shaft.

Bethlehem Steel has played a vital role in the progress of cold-heading by supplying steel wire in the proper grades and analyses, and by recommending the correct heat-treatment.

You may now be machining parts that can be cold-headed, at less cost—and with improved properties. By no means do we say that we can supply cold-heading wire for every one of them. But our experienced metallurgists have helped many users of cold-heading wire to improve their results. Perhaps they can do the same for you. Our nearest sales office will welcome the chance to talk it over. Or get in touch with us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

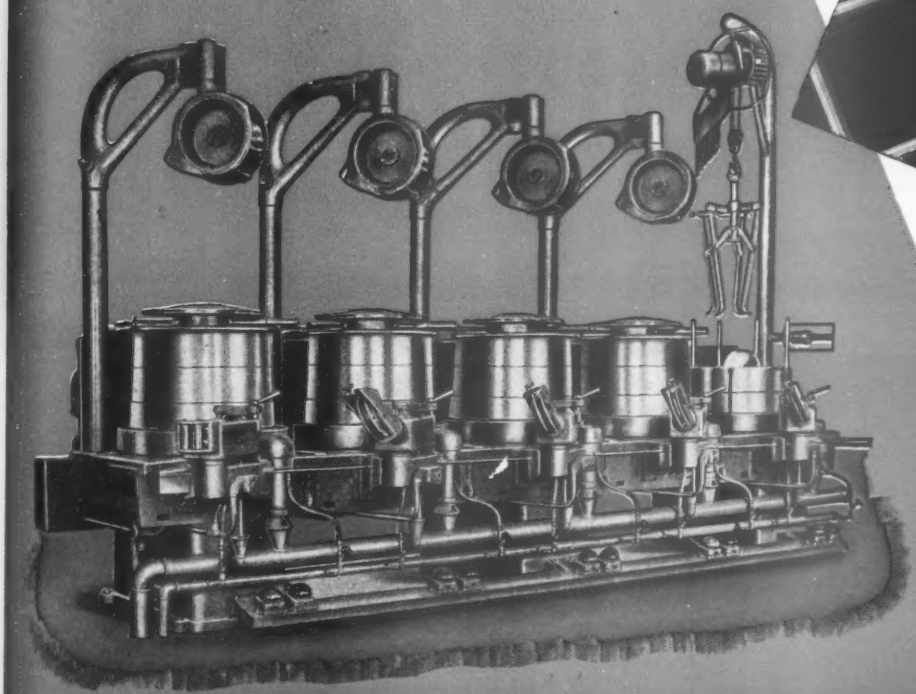
BETHLEHEM STEEL

HERBORN

Non-Slip
Continuous

Wire Drawing Machines

For Low Carbon and
High Carbon Steel Wire



Please send your inquiries to

MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G. **HERBORN/DILLKREIS**
GERMANY

HERBORN MACHINERY CORPORATION, 61 Hudson Street HACKENSACK, N. J.

COULTER & McKENZIE

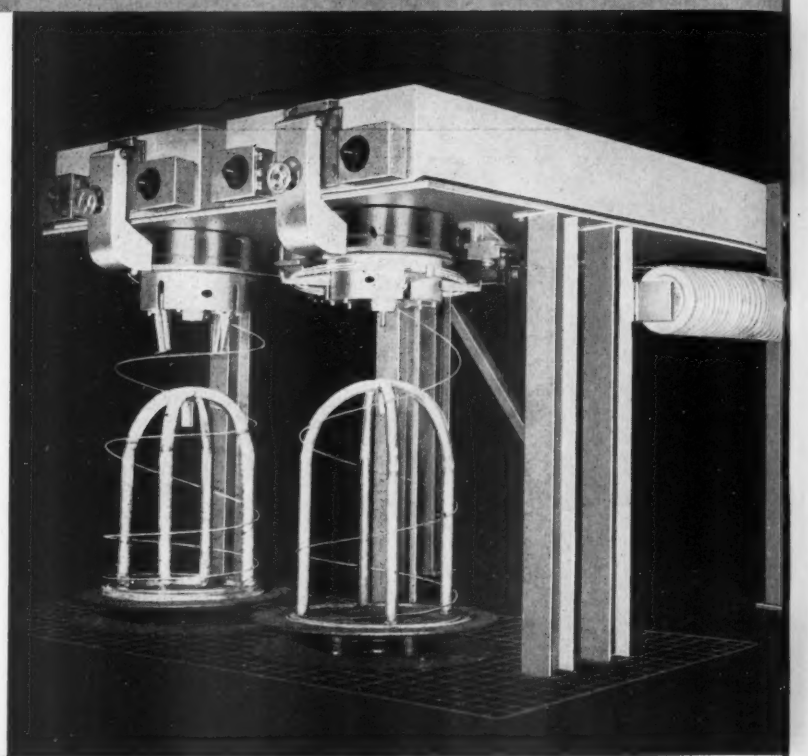
ANNOUNCES THE WIRE INDUSTRY'S MOST VERSATILE TAKE-UP & WIRE PACKAGING MACHINE!

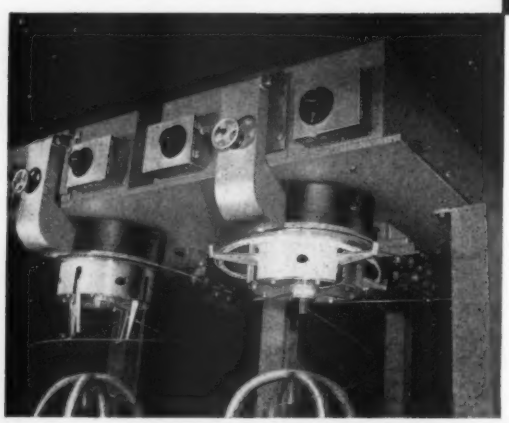
Vari-Coil

For PATENTING
ANNEALING
GALVANIZING
ENAMELING
TINNING
FINAL DRAW

- √ Non-Stop Package Changing
- √ Package Sizes to 4,000 lbs.
- √ Coil Diameters to 36″
- √ Speeds Infinitely Variable
- √ Wire Size to ⅜″ (.375″)
- √ Ferrous and Non-Ferrous Materials Including High Carbon Steel

THERE IS A SIZE FOR ALL APPLICATIONS. SINGLE OR MULTIPLE UNITS FOR YOUR INDIVIDUAL JOB.





For information concerning your application, please write or telephone.

1 INFINITELY VARIABLE RANGE OF COIL SIZES
a. All sizes wire from same capstan.
b. Current models with coil ranges 16″ to 26″ and 24″ to 36″ without changing blocks.
c. Coil sizes may be altered without stopping.

2 GREATER COIL WEIGHTS
a. Turn tables accommodate coils, drum paks and stems (200 to 1200 lbs.)
b. Oversize loads on handling pallets (1000 to 4000 lbs.)

3 INCREASED RANGE OF WIRE AND ROD SIZES
a. Precise cast control of fine wire to coarse rod.
b. No axial twist.

4 ACCUMULATOR HEAD PROVIDES INTERVAL FOR STRIPPING AT OPERATOR'S CONVENIENCE
a. Accumulator operating in conjunction with main take-up block is key to uninterrupted constant speed take-up.
b. Operator has 5 to 10 minutes accumulation time for stripping finished package from turn table.

This equipment manufactured under one of the following U. S. Patents 2,732,060; 2,868,474; 2,844,416; 2,868,268 or others pending.

Barron & Crowther Ltd., Eastleigh, Hants, England. European Draw-Pak Licensee Idos Industries Ltd., Royston, Herts, England, Sales Agents.

35 UNION AVENUE

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

SINCE 1843 BRIDGEPORT 7, CONNECTICUT, U. S. A.

The Wire Outlook

At the time this is written steel production is reported by AISI to have exceeded all previous highs for a week. The output for the week reached 2,671,000 tons — 94.3 percent of capacity, which is at an annual rate of nearly 139 million tons. This is remarkable considering the large amount of furnance relining that had to be done and the fact that some furnaces, although rehabilitated, will not be fired until a settlement is arrived at.

The attitude in Washington now is that strikes in basic industries like steel and railroads cannot be countenanced if they run more than a few days — or weeks, at the most. Should the eighty-day cooling-off period prove fruitless the Congress appears to be ready to act quickly. It feels that public sentiment is demanding corrective measures, if circumstances prove them to be needed.

While it will be well along in the first quarter before steel's customers get what they want, most industries that were down partially or entirely are again in production and most employees are back on the payrolls.

The outlook for the year is good. Automobiles are likely to sell well. New plant and equipment expenditures are expected to rise sharply. The demand for products of every kind is increasing. In fact, the appetite for goods may well be a further inflationary spur. It is estimated that the gross material product by the end of the year will reach 520 or more billion dollars, which will be 42 billion higher than for the third quarter of the old year. The cost of living index, which moved up steadily in 1959, is almost certain to continue its climb this year.

To indicate the extent of inflation in the last 30 years the Commerce Department states that the average corporation employee received an income in 1957 of $4980 a year, as against $1664 in 1929. Less than half, or about 31 million people, work for corporations, and their wages and salaries absorb about 80 percent of the corporate income. Compared to 1939 we now have a 47 cent dollar, with erosion averages of about one cent per year. The steel settlement is almost sure to result in a price rise and the new rail pact, even if there is no strike, is certain to result in freight-rate increases. All along the line, consumer goods — and taxes, too — are inching up.

Residential and store building are going to be on a lower scale this year — tight money, principally — yet consumer spending is expected to reach new highs, paralleling increased personal income. Farm income is dwindling because of rising costs.

We are not alone in our good outlook. Business in foreign countries is booming. This is a mixed blessing, for while we want our overseas neighbors and friends to prosper, it so happens that they look to this country to consume much of their surplus production — among it, to a substantial degree, wire and wire products. If the trend continues, it may become necessary for many American businesses to revamp their plans. Yet it is interesting to note that during the steel strike, with all that foreign producers could ship in, the import of rods and wire fell far short of needs.

Wire mill books are generally full for the first quarter, with a husky demand for rod, welding wire, manufacturers' wire and fabric wire. The resumption of auto building will bring a new demand for all types of wire used in these vehicles, including electric wire. Because of the demand, there will be small opportunity for the mills to accumulate inventories.

The rosy aspect of 1960, in spite of problems to be resolved, should provide a breathing spell in which to find solutions. It is not a time, however, to sit back and "let nature take its course", for too many elements will be busy trying to take advantage of any sense of complacency.

Edmund Duval Sickels
EDITOR

"this Redskin sure does the job"

Production men at Wickwire Bros. know that top quality copper wire requires a top quality coating compound. After trial runs, they were agreed that "REDSKIN" is the most efficient, the most dependable copper coating compound they have used to date!

What sold Wickwire production men and researchers on "REDSKIN"? They like the instant dissolving . . . the assured uniformity . . . the dependable performance they get with "REDSKIN" . . . with no dependence on electricity or special equipment.

"REDSKIN" is another in the long line of dependable products manufactured and sold by the R. H. Miller Co., Inc., pioneer in wire drawing lubricants and coating compounds. During our 50 years, we have concentrated on just this business . . . the development and manufacture of superior lubricants and coatings. Our men in the field are wire drawing specialists, equipped to assist you on any wire drawing problem.

Specify "REDSKIN" — finest in copper coating compound.

Redskin

METAL WORKING LUBRICANTS

R. H. MILLER

COMPANY, INC., Homer, N. Y.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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THE MORDICA MEMORIAL LECTURE FOR 1959

The Manufacture of Precision Cold Drawn Shaped Wire

by John Rigby
Managing Director
John Rigby & Sons Ltd.
Low Moor, Bradford, England

Mr. Rigby presented this lecture at the opening session of the Annual Convention on Monday afternoon, October 12, 1959, in Cleveland, Ohio. Each year the Board of Directors select a member whose achievements in the Wire Industry have been outstanding and invite him to present a lecture on a topic of his own choosing. It is considered the highest honor within the power of the directors to bestow.

Mr. Rigby commenced his training in wire manufacture at the age of 18. On completion of this he was sent to Australia and New Zealand for a year on sales and market research. He returned to the plant and a while later was sent to Canada to investigate sales markets. From 1933 to the outbreak of World War II he was Director in Charge of plant development at the company's various plants, during which period he made many trips to the U.S.A., Germany, France, Belgium and Switzerland to study manufacturing methods.
At the close of the war he led the British Intelligence Objectives Sub-Committee Team in a study of the state of the German wire industry.

Mr. Rigby has served on the Council of the British Iron & Steel Research Association and now is one of the elected representatives of The British Wire Trade on B.I.S.R.A.'s cold working panel division. He is also a member of the Iron and Steel Institute, the British Metal Sinterings Association and of The Wire Association.

He also was instrumental in getting Association members in Great Britain to join in securing for The Wire Association the handsome grandfather clock that graces the Association's offices in Stamford, Connecticut. The clock has a massive mahogany case that was built in 1770.

Mr. President, Fellow Members of the Wire Association and Guests:

* * *

The "man in the street" visualises Wire as being usually **round** in shape; so it is, but he little realises that wire of complex shapes, drawn to the size limits of **precision** demanded by the **instrument maker** is supplied in considerable quantities, and presented to the consumer ready for use, without in many cases requiring further shape machining.

* * *

This is a regular occurrence, day after day, month in, month out, year in, year out.

* * *

The importance of the use of Precision cold drawn shaped Wire, always obvious to the knowledgable engineer, in the placid times of peace, to take its rightful place in the making of parts for the Automobile, Business machine, Clock, Instrument and many other precision metal working industries, is of no less importance to Ordnance factory requirements in times of war emergency.

* * *

Let us look for a moment at a picture showing a few examples of the very fine work being turned out each day by specialists in the art of precision shaped Wire production. (See Figure 1.)

* * *

Here are shown deep grooved shaped sections in which rollers smoothly glide. Pinion rod of involute, cycloidal or epicycloidal tooth form which accurately engages racks or mating gears; wire for keen edged pawls which must snap into position with accurate fit into perfectly formed ratchet wheels made out of the Cold Drawn Ratchet section; cams of all designs giving rapid or slow movements as desired.

* * *

Here are examples of wire holding size on critical dimensions to two-ten thousandths (.0002") part of an inch over long lengths. Here is also illustrated a very low carbon **type** material with physical characteristics capable of giving clear definition to the character, with a formed shape ideal for coining.

IN MEMORIAM

JOHN MORDICA
1873-1937

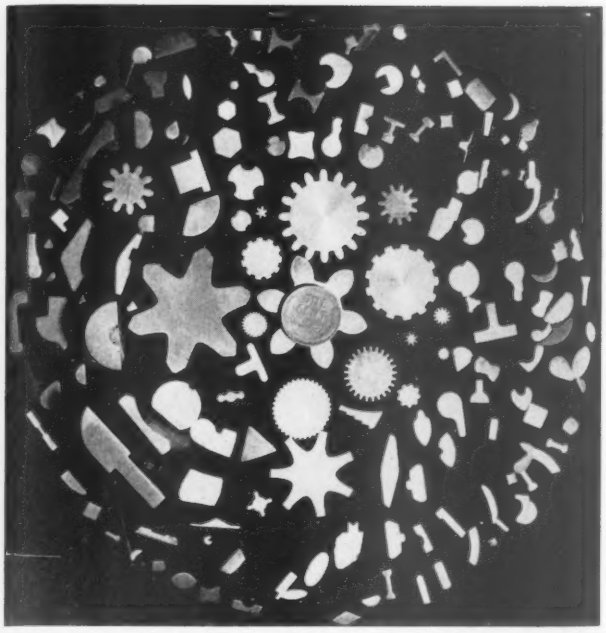


Figure 1 * * * * * * * * * * * * * * *

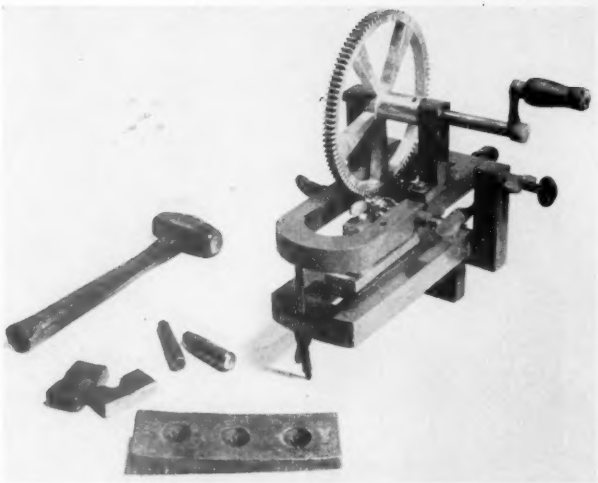


Figure 2 — Old Type of Equipment * * * * * * * * *

There is very little standardisation of shape or size in the shaped wire field, with, of course, the notable exceptions of hexagons, flats, squares and half rounds.

* * *

Literally thousands of complex shaped dies are held in stock at this time representing thousands of man-hours of expert labour.

* * *

Much shaped wire can, and is, successfully manufactured by either the cold drawing or cold rolling methods. The former by utilization of the draw plate or die, the latter by rolls or turks heads. Many examples can be instanced of either one or the other method being successfully employed. Whether to draw or roll can only be decided when a study is made of the type of shape required, the length of run, the cost of dies as against rolls, and the equipment available.

* * *

To mention a few shapes produced by **either** method there are: Locked Coil Rope, Flexible Shaft Casing, Lock Washer, Split-pin — all ferrous wires. For non-ferrous, good examples are Zipper fasteners, Optical Hinges and Commutator Sections.

* * *

The title of this lecture signifies only the manufacture of cold **drawn** shaped section wire and, therefore, it is only to the drawn material that further mention will be made and this will cover the size range from 1.5 inch^2—.0014 inch^2 in area.

* * *

Methods of manufacture and equipment used in the process have, quite naturally, altered very considerably in the past Century, as also has been the case in the production of round wire. Most of the new developments in technique have, however, assisted in **reducing the cost of production rather than affecting the quality of the product.**

* * *

The precision cold drawn shaped wire manufacturer has **always** prided himself on the high quality of this product, his control of size, shape and surface finish.

* * *

The tools of the trade used by our forefathers look comparatively crude, however, when a contrast is made with modern equipment in use today.

* * *

Here is illustrated the old type equipment used. (See Figure 2.)

* * *

We can now also observe the coating formula used and probably, very jealously guarded by one Mr. Saunders, from which it can be clearly seen that in the year 1877 the operator was extremely meticulous in his work! (See Figure 3.)

* * *

The apparent display of thrift is not an uncommon symptom and it still is found in the natives of the County of Yorkshire, England, in which he practiced his trade.

* * *

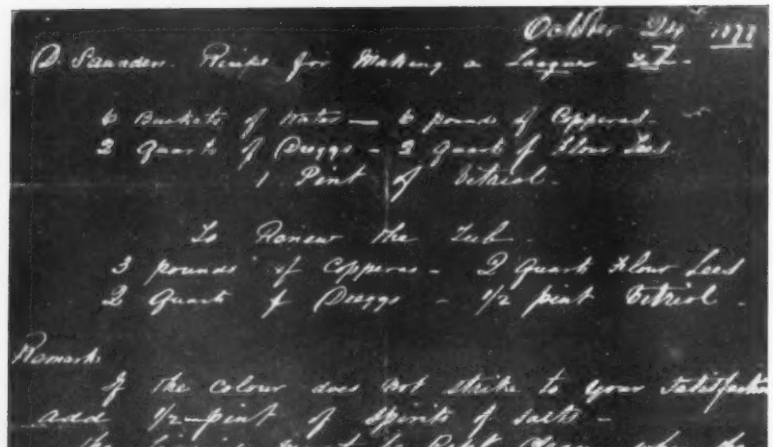
This trade, or **craft** would be a better word with which to describe it, is fascinating in the extreme and is practiced **with success** only by firms and individuals who have that attitude of mind that makes them very conscious of their many skills and who are desirous of a perfection in their end product **only** met in the field of the **precision** engineering industries.

* * *

It is well nigh impossible to **combine** bulk production of round wire with precision cold drawn shaped wire manufacture. The difference between the two wires being that, although both items need care and good quality control, shaped wire needs that **little bit of extra care in each** operation along the line.

* * *

The 13th Century Ordinance of the City of Paris which has been so well translated from the French by **Kenneth Lewis** in the preface to "Steel Wire" by **Maurice Bonzel** to read "Whosoever would enter the wire business it is required of him that he knows the trade, and that he has what it takes" is surely true in the field of Precision



October 24 1771

D. Saunders Recipe for Making a Lacquer &c.

6 Buckets of water — 6 pounds of Copperas
2 Quarts of Puggy — 2 Quarts of Flour Sal
1 Pint of Vitriol

To Renew the Tub

3 pounds of Copperas — 2 Quarts Flour Sal
2 Quarts of Puggy — ½ pint Vitriol

Remark

If the Colour does not strike to your Satisfaction
Add ½ a pint of Spirits of Salts —
the Liquid must be Kept Clean, when the
Tub gets dirty (which it will do on a wash
if you are doing anything like Work) pour
or Lead out the Liquid into a Clean
Vessell and then Scan or Clear out the
Puggy or Sediment and throw them away
then put back the Liquor and freshen up the
Tub it is of the Greatest importance that
You save your old Liquor.

Dipping Mixture

3 pounds of soft Soap
1 Quart of Oil

Made up with hot water into a Bucketful

Figure 3 —

Cold Drawn Shaped Wire manufacture.

* * *

It is interesting and important in view of the interest in the subject to consider at this time, **why** it is that the demand for our subject material is always **increasing**, regardless of the competition of extrusions, continuous casting, or of the introduction of many new materials and high speed machining and manufacturing methods which produce **parts** that could also be made from the cold drawn product.

* * *

Examples in the competing finished **parts** are also made by Powder Metallurgy, precision investment casting, cold extrusion, and impact machining, all of which are in the ferrous parts category. Hot pressings and pressure die castings compete in the non-ferrous field.

* * *

The answer to why the demand is increasing lies with the users' design engineer and cost accountant. It could be one or more of many reasons: size control, wear resistance, surface finish or shock loading properties.

* * *

To example very justifiable claims made for high durability and load-carrying capacity of **cold drawn Pinion Sections**, a leading Technical Journal, in a special report founded on information supplied by a prominent American manufacturer, very rightly states that "Cold drawing produces compression stresses which increase working strength of the teeth and gives a smooth, hardened surface. In A.I.S.I. 1112 Steel, for example, the surface of a 0.55" 12-tooth Pinion has a Vickers hardness number of 270 dropping to a 180 at the core, while that of a similar **cut** pinion was 182 at the surface and 168 at the core. These correspond to a 126,500 p.s.i. tensile for the drawn and an 85,000 p.s.i. for the cut one".

* * *

Cost per finished part is an important factor to the buyer and it is interesting to note that prime tooling costs are **not too high** in precision cold drawing work, if comparison is made with many of the competitive instances quoted.

* * *

Business Executives of today are better informed than ever before on all modern methods of production of diverse materials and it is they who provide the final answer as to what will be requisitioned.

* * *

We find that Precision Cold Drawn Shaped Wire increasingly fulfills their requirements.

* * *

Precision Cold Drawn Shaped Wire can be manufactured by specialists out of almost any metal that can be cold drawn in the **round** section. Ferrous, Non-Ferrous and even the precious metals.

* * *

This fact opens up a large field of demand that we have to satisfy.

* * *

If a shaped wire is considered desirable for use, it is customary for the prospective user's Design Engineer and the producer of the shaped wire to confer on the detail of the most suitable shape which can be drawn without undue difficulty and yet be satisfactory in performance. Much importance is attached to this, in order that size tolerances also can be checked along with the details of shape, thereby ensuring that the wire can be manufactured **at the lowest possible cost.**

* * *

Even slight modifications to shape or size tolerances can, many times, show very considerable cost savings. For example the avoidance of unnecessary sharp corners can price the product to advantage in many cases.

* * *

When the design of the shape of the finished wire has been finally accepted by the interested parties, the next step is for the wire manufacturer to make all the very nec-

essary drafting calculations and consider the geometry of die design; **never resorting to guesswork, this being a certain way of producing scrap!**

* * *

Drafting backwards from the finished size enables the manufacturer to arrive at the correct starting size and shape of the hot rolled or extruded rod.

In a section of our trade in which very little published information is available, it is interesting to read the observations of Dr. Ing. **Herman Preussler.** In the summary to his most excellent paper published in "Stahl Eisen", the two main factors which affect the cold drawing of sections are—here I quote the English translation:—

"1) The deformation depends on the friction between the die and the metal being drawn.

2) The deformation depends on the plastic flow of the metal in the direction of pressure.

* * *

The first factor is of great importance in the drawing operation as the die gives a pressure which is everywhere normal to the periphery of the section, i.e., perpendicular to the sides of the section.

* * *

The second factor means that the section being drawn tries to keep to its original shape and the reduction does not become zero at the corners.

* * *

The section to be produced is drawn out and divided into parts to conform to the law of plastic flow and each of these parts is given a proportional reduction. The area reductions are calculated separately."

* * *

It will be realized that **irregular** shaped parts are far more difficult to calculate for drafting than **regular** shapes. (See Figure 4.)

* * *

Having decided on the method of drafting to be adopted, the question of the **type** of die to be utilized is settled. Is it to be a solid or a segmental die?

* * *

For ease of manufacture a segmental die is sometimes preferred, that is if the section to be drawn is suitable for drawing in this type of die. Profile grinding of the segments can be readily accomplished on the modern profile grinder. The segments must have **perfect fit** and the die case designed of substantial proportions to prevent springing during work. Adjustment of the segments is accomplished by either wedges or screws.

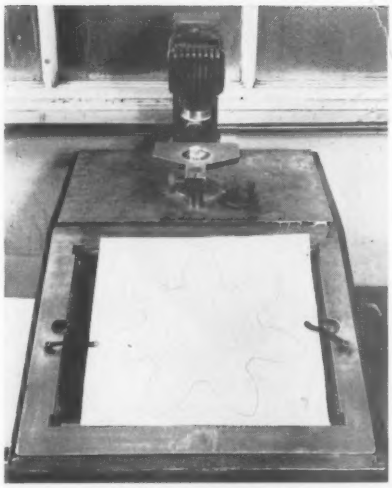


Fig 4 — Projection of Profile * * * *

* * *

If a solid die is required, the machining and setting needs entirely different techniques; these are described later.

* * *

The die material can be either alloy steel or Tungsten Carbide; the setting of the former can be performed by hot stamping and hubbing or by hand worked cold forming with the punch and sett. The Alloy Steel draw plate can, of course, be re-set easily by cold work and used many times at the original size.

* * *

The present trend, however, would seem to favour the use of **tungsten carbide,** particularly on the longer runs, largely because of its unique feature of holding size accurately on the long length pieces.

* * *

The change to Tungsten carbide has not occurred in the precision shaped wire industry with the rapidity or spontaneous enthusiasm as was the case in the production of round wire. This is probably explained by the fact that the die designs of complicated shape draftings have for many years been jealously guarded **"trade secrets"** and unless the wire drawer was fully equipped to form from the round, or sinter **his own** shaped carbide pellets, quite naturally, he refrained from asking the large independent die makers to take on his work. (See Figure 5.)

Fig. 5 — Shaped Die * * * * * *

The manufacturing technique and metallurgy of the tungsten carbide die pellet is a subject of much detail and cannot be described in one paper such as this, it is therefore, only possible to give a brief description of the methods employed to produce the pellet by the very suitable **hot press method.**

* * *

Hot pressing is more suited than cold pressing to shaped die manufacture for various reasons.

* * *

In the first place, **shrinkage is reduced by this method to the minimum;** the die comes out of the mould near to finished size, thereby reducing to the minimum the time taken in carbide removal in the final machining to shape.

* * *

Hot pressing is also more suited to the **small volume production required.** In the cold press system high quantity loading of the sintering furnace is really necessary to achieve economical results.

* * *

By the hot press method there is little danger of **bridging of the powder,** which could cause blemishes in the finished die — an important factor to consider in an

intricate shaped die.

* * *

Carbon mould, shaped cores and pressure collars are machined to the required shape, the cores fitted, the cored cavity charged with tungsten carbide powder of suitable grain size, suitably prepared with the required amount of cobalt, pressure collars inserted and the mould placed in position on the press.

* * *

Heat is applied by either electric induction or direct resistance through the mould or through the furnace wall. The requisite pressure is applied during the **temperature rise.**

* * *

This combined sintering and pressing operation is **speedy,** sintering time being measured in minutes.

* * *

The pellet, or pellets are then extracted from the carbon mould and suitably mounted by either brazing or by shrinking the die case to the pellet. Machining to final shape is then commenced.

* * *

Machining of tungsten carbide, prior to the discovery of the methods of spark erosion and ultrasonic cutting was a **slow and tedious operation.** These interesting new methods have however, completely revolutionized the cutting of carbides, thereby encouraging its greater use for the die material. Continuous improvements and new developments are taking place in these machines.

* * *

The conventional design of spark erosion or electrical discharge machines, working with Servo feed mechanism, rapidly remove the carbide, but the electrical characteristics of the machine must be so designed as to eliminate any tendency to continuous arcing, which can cause pitting of the carbide. Two different circuits are in regular use, the "relaxation" and the "pulse", the latter giving the smoother finish. (See Figure 6.)

* * *

Ultrasonic cutting, or "impact grinding", can be used to produce an exceedingly good surface finish.

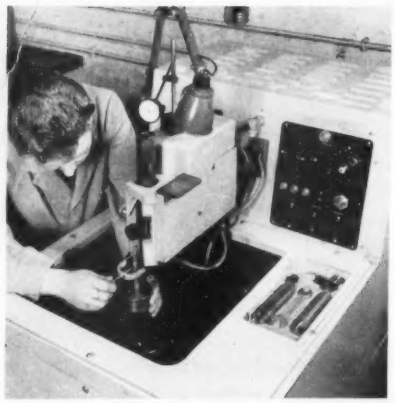


Fig. 6 — Spark Erosion Equipment * *

The rate of cut seems slower than that of the spark but this method gives good control of size.

* * *

The operation of the ultrasonic machine is, however, an extremely delicate procedure; fine tuning by a very experienced operator is required. The truncated monel metal cone fixed to the transducer must be so shaped and of suitable dimensions to obtain the best cutting results on each different section. The water and 280 grit abrasive must be pumped freely over the whole work needle to ensure even cutting. The work needle, which vibrates at approximately 19,000 to 26,000 oscillations per second, enables the abrasive to bombard and cut the surface of the carbide. (See Figure 7.)

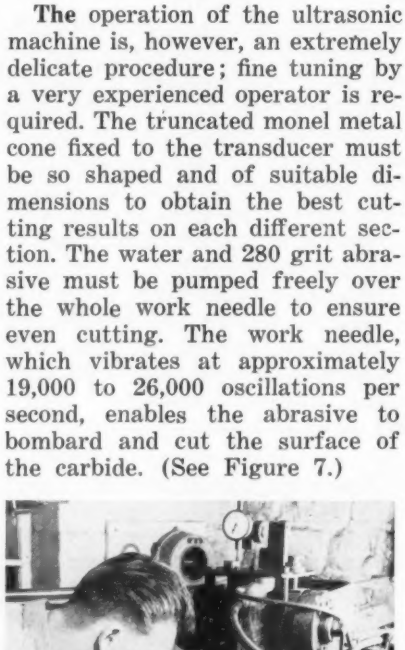


Fig. 7 — Ultrasonic Equipment * * *

For ultrasonic machining, a needle of steel is employed, whereas the electrodes used in spark erosion are usually of copper, brass or silver tungsten.

* * *

Work needles or electrodes are pre-shaped to the desired profile and drawing angle.

* * *

Very tight tolerances in die sizes are the **rule** rather than the **exception** and **extremely careful hand lapping final operations** are necessary to blend the entrance angles, bearing and back relief. The slightest mis-alignment of these surfaces can fault a die.

* * *

The look of satisfaction on the face of a skilled die maker after receiving critical examination and approval of a newly designed sectional piece, is a delight to observe. Gone are his doubts as to whether he would hit size and shape "on the nose", his fears of sucking down in size, pitted appearance, chatter or scrape marks. He is a **proud** man, and **rightly** so, because with all the assistance of modern methods and machines it is **his** skill and **his alone** that has been necessary to produce the **finished** article.

* * *

Inspection of the raw material to be drawn is extremely rigorous; this is inspected for size, surface finish, laps, seams, flaws, inclusions. Analysis is checked and tests are made to detect any segregation.

* * *

Following the inspection there is the preparation of the raw material prior to drawing; this is important, but is similar in many ways to the methods in use in the round wire industry, by pickling and coating. It must always be remembered, however, that the cleaner the rod or wire and the more perfect the coat, if ferrous wire is being drawn, the better the life of a die, which is certainly more delicate and more costly than a die for round wire. For ferrous wires the coating can be a ferrous sullcoat, copper sulphate, stannous sulphate or a phosphate preparation.

* * *

Occasionally protective or decorative metallic coatings are desired on finished ferrous wire. Hot dip or electro deposited tin or zinc finishes are usually applied prior to the final draw pass.

A process of **much importance** in shaped wire drawing is the preparation of the leading end point. It will be readily understood that where there is obvious difficulty in butt welding and trimming a complicated shape that pointing becomes a major problem. It is also very factual to state that a bad point **can completely ruin a die.** Therefore, it is very necessary to obtain a point, evenly tapered, of smooth surface and of sufficient length to enable a good firm grip to be obtained by the pulling-in dogs. Now that the die is in more regular use the long point is more essential than ever it was with the plate, due to the thickness of the backing to the carbide pellet restricting the dog coming close to the point of exit.

* * *

These points can be formed by either shape roll pointing, grinding, hot stretching or chemical erosion.

* * *

The preliminary surface preparation and pointing of the wire having been accomplished, cold drawing is commenced on either block, if in coil, or draw bench, if in lengths.

* * *

Usually only simple concentric shapes are drawn on **continuous** drawing machines.

* * *

Some difficulties and recommendations for the **continuous drawing** of certain shapes are mentioned by **Vito J. Vitelli** in his interesting paper delivered at The Wire Association Meeting in Chicago in 1953.

* * *

Drawing speeds are slow as compared with round wire in any metal.

* * *

The lead-in of the wire to the die must be under control to prevent twist or lash; it is desirous that the wire drawing machines have a creep start and there must be no vibration. Correct orientation of the die is essential, to ensure even feed up the block.

* * *

Lubrication in the early passes is usually conventional lime-soap combinations, but for finishing passes, depending on the finish required, these are varied from solid to liquid lubricants. On the more difficult-to-draw material it has been found that molybdenum disulphide has given first class results as an additive to the lime-soap mixture.

* * *

During the drawing programme of size reduction and shape formation several heat treatments may be found necessary. The equipment and methods again are very similar to those in use in the round wire industry. Salt bath, pit, top-hat, muffle or conveyor types are all in use.

* * *

The salt bath, where applicable, is particularly good for wire in coils. The wire, after having undergone heat treatment is ready, without further man-handling, to be dipped in the various cleaning and coating solutions and the coils also, by the virtue of being suspended in a vertical position on the charge carrier, do not twist, crush or distort, a factor of much importance on wire of delicate profile in the following drawing operation. (See Figure 8.)

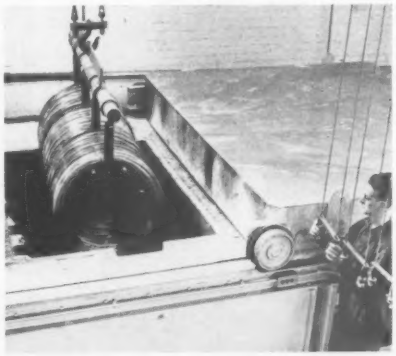


Fig. 8 — Salt Bath Annealing * * * *

In all the various processes described the supervision and control on the shop floor must be of the highest order. It has been said that the Supervisor's most important function is **to keep high the standard of personal dissatisfaction,** and how true this is! Scrap losses through badly drawn shaped wire can be disastrous; nothing can be done to retrieve badly drawn material; it has only one **safe** destination—**the scrapyard!!**

* * *

Final inspection of the cold drawn product consists in the main of screen projection by optical comparator for shape and size measurement, go and non-go guages, hardness testers, and visual examination for surface finish.

* * *

An interesting test instrument in use at this time for testing sprag section is the electronic device shown by kind permission of the Borg Warner Corporation, on which instrument, developed by **Mr. E. A. Ferris,** that Company holds master patents. (See Figure 9.)

Fig. 9 — Borg-Warner Electronic Machine *

This machine is an electronic device which plots on a graph the strut angle, i.e., the angle of friction measured in degrees, against the increase in size measured across the end radii, these being the working faces of the section. Any minute inaccuracy in the two radii, or their co-relationship are immediately apparent by a deviation of the plotted graph from the theoretical strut angle curve.

* * *

Tests such as torsion, bends, etc., routine to the round wire industry, are seldom required for the cold drawn shaped wire.

* * *

Precision cold drawn shaped wire is supplied in coils or lengths as desired.

* * *

This concludes an only too brief description of the subject "The Manufacture of Precision Drawn Shaped Wire" in which the following items have been covered.

1) **The types of shaped wire which are cold drawn.**

(*Please turn to page* 125)

1,000 lbs. OF WIRE

OR 500 lbs.

ACCURATELY PACKAGED AND SHIPPED

WITHOUT A REEL!

YOU CAN DO IT 2 DIFFERENT WAYS WITH **ACROMETAL** EQUIPMENT

DETAILS OF AIR PRESSURE ADAPTATION

- We have the experience and the practical advantage of developing these systems in cooperation with three big wire mills. Make use of our know-how.
- This process reduces your investment in heavy reels.
- It makes big savings in freight costs.
- It eliminates rewinding before stranding.
- You can anneal wire in these big packages without using reels!
- They tell us this is the most imaginative advance in wire packaging in 20 years and we can help you as we are helping others. *Write us.*

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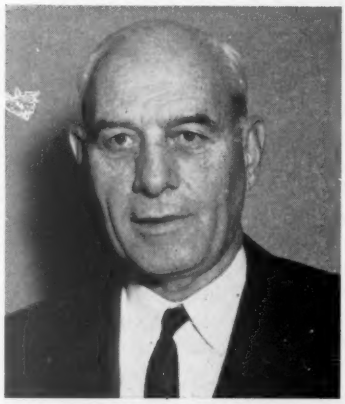
The Story of the Annual Convention of The Wire Association

by Edmund D. Sickels, Editor
Wire and Wire Products
Stamford, Connecticut

Allan B. Dove
President of the Association



Walter B. McShane
General Program Chairman

All who attended agree that the Convention in Cleveland was excellent. The four day program was packed with full scheduled for the Ferrous, Non-Ferrous and Electric Wire and Cable Division people.

* * *

Total overall registration reached 587. The Convention got off to a good start with the opening of the registration desk on Thursday, October 12, at 9 o'clock in the Statler-Hilton Hotel. Many persons had arrived on Sunday, giving an opportunity for visiting at the Association's headquarters and other suites.

* * *

The only business of Monday morning, apart from registration, was the Directors' Meeting.

Meeting of the Board of Directors

Allan B. Dove, President, called the meeting to order at 10:00 A.M.

* * *

As the first order of business Executive Secretary Brown read the minutes of the last meeting and as Secretary-Treasurer made the semi-annual report. Both were duly approved.

* * *

J. Edward Donnellan, as one of the tellers, gave the results of the mail ballot by members on the election of directors, the following men becoming directors: **John W. Campbell,** Asst. to Pres., Wickwire Bros., Inc., Cortland, N. Y.; **E. R. Craig,** Wire Div. Supt., Continental Steel Corp., Kokomo, Ind.; **R. W. Higginbottom,** Chief Cable Eng., Triangle Conduit & Cable Co., New Brunswick, N. J.; and **William E. Hitchcock, Jr.,** Vice Pres., Atlantic Wire Co., Branford, Conn. The foregoing are new directors elected to serve for the next three years replacing Messrs. **Fred M. Crapo, Glenn R. Lee, A. M. Reeder,** and **Benoit J. Sirois,** all of whose terms of office were completed.

* * *

Directors re-elected for another three years were Messrs. **W. Roy Mackay, Earl R. Potter, John L. Sanderson,** and **Marshall V. Yokelson.** All new and re-elected directors were formally declared seated and qualified to vote before the new business on the agenda was considered.

* * *

A question was raised on the directors' luncheon to program participants, it being suggested that it be discontinued because of the size and expense. It was decided to continue this practice.

* * *

Discussion was held also of the matter of the profit made on the hospitality hour at Boston. Mr. Brown pointed out that the surplus funds were placed in a separate account for the Electric Wire and Cable Committee to use at future meetings, since the local committee had raised the money themselves. He noted that this same thing had been done by the Pacific Coast Meeting Committee since a surplus had been shown on this single event.

* * *

Mr. McShane reported that a good prgram had been arranged for this Convention, stating that he had had the finest kind of cooperation from his several committees. He said that the plant inspection tour of their Cuyahoga Works had been cancelled, but that the Vaughn Machinery Company had offered to open its plant for an inspection tour. He called attention to the plans for Tuesday afternoon for the ladies.

* * *

Mr. Lawson reported on the Electric Wire and Cable Committee's 1959 activities and the directors authorized the holding of a meeting in the Spring of 1960.

* * *

Mr. Girdler, speaking for the Board of Past Presidents, reported on the selection of **John Rigby** as the 1959 Mordica Memorial Lecturer and recommended that **Godfrey Lewis** be chosen for the honor in 1960. The nomination was approved.

* * *

Mr. Reeder, as Chairman of the Nominating Committee for officers, proposed the names of Mr. Dove for President, Mr. Worth for Vice President, Mr. Lawson for Vice President, and Mr. Brown as Executive Secretary. These nominations were duly approved.

* * *

Mr. Potter, Chairman of the Nominating Committee for the

Executive Committee, proposed Mr. Dove as Chairman, and Messrs. Lawson, Worth, McShane, and Yokelson as members. The nominations were formally aproved.

* * *

At this point the new directors became eligible to vote.

* * *

Under new business, the matter of a General Program Chairman for the 1960 Convention in Chicago was brought up. It was pointed out that a non-ferrous man could be asked to undertake this responsibility. Note: Shortly following the meeting, Mr. Lawson advised Mr. Dove by letter hat **G. G. Stendahl** of the Hawthorne Works of Western Electric Company, Chicago, had been cleared by his company to serve as General Program Chairman.

* * *

Mr. Dove announced that Director **Earl R. Potter** had expressed willingness to serve as Program Chairman for the Regional Meeting to be held in June, 1960, in Los Angeles. The apointment was confirmed.

* * *

As Mr. Schmid had asked to be relieved of the chairmanship of the Awards Committee, **Dartrey Lewis** of Roebling's was appointed his successor.

* * *

Mr. Lawson reported on the resignations and additions to the Electric Wire and Cable Committee, the details of which are reported under the heading of the meeting of that committee.

* * *

Mr. Dove reappointed the Membership Committee, to consist of Messrs. Crewe, Flood and Whitney.

* * *

Discussion of the provision of the By-Laws which prohibits more than one man from one company holding the office of director. Consolidations and mergers of concerns have brought many competing concerns under one ownership. It was finally decided to defer decision on the elimination or modification of the By-Laws until the Spring meeting of the Board, the motion to eliminate it now being defeated.

* * *

Mr. Dove brought up the question of holding a Convention at a resort city. Mr. Brown reported the results of his investigation. It was voted to go to French Lick Springs if our requirements could be met.

* * *

Mr. Malo proposed that an industry survey be made to determine the number of persons who are interested in the several Association divisions as a guide to shaping programs for future meetings. He was asked to submit a plan for this, following which Mr. Brown will have the survey made. Messrs. Williams and Sirois were asked by Mr. Dove to work with Mr. Malo in the preparation of the report.

* * *

Following a motion to approve the acts of the officers for the period covered by the Secretary-Treasurer's semi-annual report, which was duly carried, the meeting was adjourned at 12:20 P.M.

The Directors Luncheon

Approximately 65 persons attended this luncheon, an annual opportunity for the directors, program committee members and the men presenting papers to get together and become acquainted.

* * *

The gathering was addressed after the luncheon by President Dove, who thanked the program participants for their work and called attention to a number of details regarding the coming sessions.

The Joint Technical Session

At 2 o'clock on Monday, October 12, the serious business of the Convention got under way with **Allan B. Dove,** President, serving as Moderator, who was introduced by **Walter B. McShane,** General Program Chairman. Mr. Dove welcomed the assemblage and as the first order of business presented those who had attained to the 25-year Association membership status with suitably inscribed certificates. These gentlemen were:

David Dwight Buchanan
Johnstown, Pa.

Frederick W. Gaines III, Gen. Mgr.
Ajax Mfg. Co., Cleveland, Ohio

Joseph A. Hague, Asst. G.M.-Sales
Pittsburgh Steel Co., Pittsburgh, Pa.

Charles E. Hughes
Destin, Fla.

David B. Ireland, Sr., Secy-Treas.
Wolverine Bolt Co., Detroit, Mich.

James F. Kavanaugh, Supvr., Wire Div.
C. O. Jelliff Mfg. Co., Southport, Conn.

Eugene Roth, Pres.
Eugene Roth, Inc., White Plains, N. Y.

Geoffrey K. Rylands, Man. Dir.
Rylands Bros. Ltd., Warrington, Eng.

Emerson Spear, Vice Pres.
Pacific Wire Rope Co., Los Angeles, Cal.

Alexander B. Stirling, Secy.
The Greening Wire Co. Ltd., Warrington, Eng.

Curtis Voigtlander
Erlton, N. J.

William J. Wind, Sr., Vice Pres.
William B. Driver Co., Newark, N. J.

Following this he introduced the principal speaker of the day, **John Rigby.**

The Mordica Memorial Lecture

The honor of presenting this lecture in 1959 had fallen upon the very able shoulders of Mr. Rigby, the Managing Director of John Rigby & Sons Ltd. of Low Moor, Bradford, England.

* * *

Mr. Rigby's subject was "The Manufacture of Precision Cold Drawn Shaped Wire." The lecture, given each year by an Association member who has achieved outstanding distinction in our industry, is the highest honor within the power of the Board of Directors to bestow. His splendid lecture, which upheld his reputation as a man of unusual vision and ability, is published in this, the January Convention Proceedings Issue.

Technical Papers

The afternoon session contained two technical papers of general interest:

"Manufacture of Wire Products — Oven-racks, Baskets, and Refrigerator Shelves," by F. B. Thacker, Bauer Bros. Co., Springfield, Ohio, and "The Impact of Modernization in Wire Weaving," by T. L. Stilwell, Sales Manager, Warner-Swasey Co., Cleveland, Ohio.

As Mr. Stilwell was in Europe, his paper was read by Harvey P. Balsom, District Manager of Warner-Swasey.

A fine sound-color movie on the "Building of the Mackinac Bridge," shown through the courtesy of the **American Steel & Wire Division** of United States Steel Corporation, closed this opening session.

THE TECHNICAL SESSIONS

9:00 A.M., October 13, 1959

Ferrous Division

With Stewart S. Gray, Asst. Vice Pres., Union Wire Rope Corp., Kansas City, Mo., serving as Moderator, four papers were presented:

"A New Method for Fatigue Tests on Steel Wires and Wire Ropes and the Viewpoints Opened by the Results Obtained" by Denis van de Moortel, Technical Chief Manager, United Rope Works, Leiden, Holland.

"Air Force Tow Members" — by Jack E. Tiede, Supervisory Eng., Air Force Proving Center, Elgin Air Force Base, Florida.

"High Temperature Tests of Aircraft Control Cable" — by Howard J. Godfrey, Asst. Chief Devel. Eng., John A. Roebling's Sons Corp., Trenton, N. J.

"The Rolling of Round Wire into Flats and Rectangles" — by Alexander F. Sperduti, Asst. Chief Eng., The Fenn Manufacturing Co., Newington, Conn.

Non-Ferrous Division

David M. Schmid, Pres., Techalloy Company, Inc., Rahns, Pa., who is also the Non-Ferrous Program Chairman, occupied the Moderator's chair for this session. The papers presented were:

"Trends, Copper and Copper Alloy Rod and Wire" — by Richard J. Christine, Metallurgical Mgr., Torrington Div., The American Brass Co., Torrington, Conn.

"A Substitute for Silicon-Bronze — Its Fabrication and Properties" — by Roger E. Martin, Chief Met., Triangle Conduit & Cable Co., New Brunswick, N. J.

"Recent Developments in Aluminum Alloy Wire" — by Charles L. Kessler, Chief Works Met., Aluminum Company of America, Massena, N. Y.

Electric Wire & Cable Division

With James E. Flood, Technical Director, Plastic Wire & Cable Corp., Jewett City, Conn., as Moderator, a group of papers on plastics were given. Mr. Flood was the Program Chairman for the Electric Wire & Cable Section.

"Facilities for Wire Irradiation with an Electron Beam Generator" — by R. P. Skundberg, X-Ray Dept., General Electric Co., Milwaukee, Wisc.

"The Use of Irradiated Polyethylene in Wire and Cable" — by A. N. Towne, Specialist-Market Devel., Insulating Materials Dept., General Electric Co., Schenectady, N. Y.

"Chemically Cross-Linked Polyethylene" — by Michael M. Suba, Product Sales Mgr., Union Carbide Plastics Co., New York, N. Y.

2:00 P.M., October 13, 1959

Ferrous Division

Rudolf H. Hertzog, Met. Eng., Wire Mills Div., John A. Roebling's Sons Corp., Trenton, N. J., was Moderator for this second Ferrous Division Session, in which three papers and two films were presented.

"ABC of Better Lubrication and Cooling in Steel Wire Drawing" — by J. G. Wistreich, Head, Mechanical Working Div., British Iron and Steel Research Assn., Sheffield, England.

"Straightline Non-Slip Wire Drawing with Electrical Equipment Using Alternating Current" — by Robert H. Geiss, Manager, Herborn Machinery Corp., Hackensack, N. J.

"Long Production Run Wire Coils" — by Uno V. Johnson, Supt., Rod and Wire Div., Detroit Steel Corp., Portsmouth, Ohio.

A motion picture on the "Handling and Packaging of Large Rolls at Detroit Steel Corp." was then shown as a supplement to Mr. Johnson's paper, by J. F. Blackman of the Signode Steel Strapping Co., Chicago, Ill.

A final film, "Use of Wire in the Cold and Hot Forging Industries," was then shown by Dale Walcutt, The National Machinery Co., Tiffin, Ohio, concluding the session.

Non-Ferrous Division

Henry McConnell, Wire Plant Mgr., Sylvania Electric Products, Inc., Warren, Pa., occupied the chair as Moderator for this session. Papers given were:

"Engineering Wire Tensions" — by Dr. Erwin Saxl, President, Tensitron, Inc., Harvard, Mass.

"Some Metallurgical Factors in the Manufacture of Fine Wire" — by C. M. Jackson, J. G. Dunleavy & A. M. Hall, Alloy Development Div., Battelle Memorial Institute, Columbus, Ohio.

"Drawing Titanium and Zirconium Wire" — by Robert Knight, Sales Mgr., Johnston & Funk Metallurgical Co., Wooster, Ohio.

"Applications of Photoelastic Coatings to Measurements in the Manufacture of Wire" by Frank G. Tatnall and Dr. Felix Zandman, Tatnall Measuring Systems Co., Phoenixville, Pa.

Electric Wire & Cable Division

Urbain J. H. Malo, Technical Director, Narragansett Wire Co., Pawtucket, R. I., who had been responsible for arranging the fine meeting of the Electric Wire & Cable Section held in Boston the preceding April, was the Moderator for this session, at which three papers were heard:

"Thin Metal Strips for Sheathing Telephone Communication Cables" — by H. N. Padowicz, Senior Staff Engineer, Cable Development, Western Electric Co., Kearny, N. J.

"Bonding Characteristics of Insulating Varnishes and Wire Enameling Systems" — by Donald L. McClenahan, Chief Elec. Eng., Schenectady Varnish Co., Schenectady, N. Y.

"Catalyst Applications for Continuous Strip Ovens" — by Richard J. Ruff, President, Catalytic Combustion Corp., Detroit, Mich.

9:00 A.M., October 14, 1959

Ferrous Division

Carleton W. Garrett, Met. Eng., Graham Research Labs., Jones & Laughlin Steel Corp., Pittsburgh, Pa., functioned as Moderator at this interesting session, introducing four speakers and their subjects, as follows:

"The Manufacture and Properties of Basic Oxygen Steel for Wire Products" —by H. B. Emerick, Dir. of Technical Services, and Sol Kreisberg, Metallurgical Supvr., Jones & Laughlin Steel Corp., Pittsburgh, Pa.

"High Speed Rod Rolling" — by E. L. Chamberlain, Div. Supt., American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

"Quality Control in an Alloy Steel Bar Mill" — by T. P. Davis, Statistical Quality Control Eng., Allegheny Ludlum Steel Corp., Watervliet, N. Y.

"Work Sampling in a Nail Mill" — by J. T. Weir, Statistical Eng., American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

Non-Ferrous Division

David M. Schmid, President of Techalloy Company, Inc., Rahns, Pa., the Moderator for this technical session, introduced four speakers, as follows:

"Glass Sealing Wires" — by Robert R. Brenan, Senior Engineer—Wire, Sylvania Electric Products, Inc., Warren, Pa.

"Some Age Hardenable Copper-Base Alloys for Wire Products" — by Donald E. Pardon, Design & Devel. Eng., Chase Brass & Copper Co., Waterbury, Conn.

"Copper's Future" — by R. P. Koenig, President, Cerro de Pasco Corp., New York, N. Y.

Since Mr. Koenig had to go to Europe, his paper was ably presented by A. Russell Merz, the company's Vice President.

"Vacuum Annealing of Wire" — by Karl H. Fritz, Director, and Georg A. Michael, Manager, Ofenbau Fritz G.m. b.H., Hagen, Germany. Mr. Michael presented the paper. A supplemental talk was given by Mr. Schmid, and R. J. Perrine of The Electric Furnace Co., Salem, Ohio, was called upon to describe a new continuous vacuum furnace that his company is bringing out soon.

Electric Wire & Cable Division

Philip H. Snyder, Plant Mgr., Electric Auto-Lite Co., Hazelton,

Pa., Moderator for this last session on insulated wire, presented three speakers and their subjects:

"Production and Laboratory Control of High Quality PVC Compounds for Wire and Cable Insulations and Jackets" — by Q. R. Ball, Asst. Supt., Cable Engineering Labs., Wire & Cable Div., Northern Electric Co. Ltd,, Lachine, Que., Canada.

"Small Diameter Power and Control Cables" — by Maurice M. Gilbert, Senior Electrical Eng., E. I. du Pont de Nemours & Co., Wilmington, Del. The paper was delivered by Fred Gibson of du Pont in the absence of Mr. Gilbert.

"An Improved Aging Method of Vinyl Insulation Compounds in a Modified Testing Oven" — by Dr. Marcus Royen and presented by Allen E. Polson, Apex Tire & Rubber Co., Pawtucket, R. I.

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All papers presented at the various technical meetings were published in Wire and Wire Products in October and succeeding months.

Meeting of Electric Wire & Cable Committee

2:00 P.M., October 14, 1959

Committee Chairman, **Clement C. Lawson,** of Bell Telephone Laboratories, Inc., Murray Hill, N. J., called the meeting to order and read the minutes of the meeting of April 28, 1959, which were approved with one modification — that of not having a dinner at future regional meetings of the division.

* * *

W. R. Moyers, Chairman of the Committee on Membership, reports on his efforts to secure new members to bring the membership up to twenty-five. While the work of bringing the committee to its full authorized strength of 25 members had not been completed, he proposed the names of **James Thomas,** Phillips Electrical Co., Ltd.; **Alfred Garshick,** Boston Insulated Wire Co.; **Glen Moher,** Canadian General Electric Co., Ltd.; **Robert Frank,** Packard Electric Div., General Motors Corp.; **Benoit J. Sirois,** Phelps Dodge Copper Products Co.; and **Charles Townsend,** Anaconda Wire & Cable Co.

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These men were considered and approved separately, although a few will have to defer their final acceptance until they have an opportunity to consult with their home offices. Committee members were asked to submit further suggestions to Mr. Moyers.

* * *

As the Directors had approved a meeting of the Electric Wire and Cable Section next Spring, various locations and possible plant visitations were discussed, a decision to hold the meeting in Philadelphia in April on two days to be determined, with a plant visit to **Walker Brothers** in Conshohocken, Pa. **James Higgins** of this company was decided upon as the Program Chairman. Both the plant visit and Mr. Higgins' appointment are to be confirmed.

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Mr. Malo, Chairman of the Committee on Policy, presented a long memorandum outlining a proposed set of rules governing the management of the Electric Wire & Cable Section and some policies with respect to Committee membership, the sense of which was that members should be active on the Committee to serve on it. The memorandum was discussed and approved as a guide for future activities, with a vote of thanks to Mr. Malo for his fine efforts.

* * *

A request had been received by the secretary that the West Coast members be empowered to form a similar committee there. It was decided that Kenneth Frazer of the Essex Wire Company of California be asked by Chairman Lawson to become a member of this committee and to work with him toward the development of a West Coast Sub-Committee.

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There being no further business, the meeting was adjourned at four o'clock.

Annual Meeting of The Wire Association

President Dove called the meeting to order at 4:00 P.M., October 14, 1959. More than a quorum being present, the calling of the roll was dispensed with upon due motion and approval.

* * *

Mr. Brown read the minutes of the preceding meeting which were accepted. As Secretary-Treasurer he then read the semi-annual report. This too was approved as presented and the auditor's reports were placed on the table for inspection.

* * *

The directors' discussion of the change in the By-Laws was brought up and further discussed, Mr. Dove pointing out that the matter would be considered further at the next Board meeting and appointed Mr. Whitney to head a committee, selecting four men of his choosing to make recommendations to the Board.

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Mr. Dove then reported on the several actions taken by the directors on the preceding Monday. He thanked Mr. Schmid for his work during the last several years as head of the Canada Committee, when announcing the appointment of **Dartrey Lewis** to the post.

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He also called attention to the fact that the Soviet Union was making 10,000 offset copies of each issue of Wire and Wire Products to distribute behind the Iron Curtain. Mr. Dove felt that we should have more complimentary copies placed about in libraries and technical schools, but Mr. Brown pointed out that the cost of this would be prohibitive for a small business.

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The President noted that we had people from Canada, England, Germany, Belgium, Holland, France and South Africa in attendance this year.

* * *

Mr. Lawson reported on the activities of the Electric Wire and Cable Section in Boston, here in Cleveland, and for the next year in Philadelphia, at which James S. Higgins of Walker Brothers, Conshohocken, Pa., would serve as Program Chairman.

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Mr. Dove noted the excellent work of Mr. McShane as General Program Chairman and moved that a vote of thanks be extended to him and his committee. The motion was duly passed.

* * *

In commenting on the Regional Meeting to be held in Los Angeles in June, Mr. Potter, Program Chairman, extended an invitation to all to make the trip to Los Angeles for the occasion.

President Dove asked for comments on the new program arrangements instituted in 1959 and received several voices of approval and no adverse ones.

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He lastly called for a motion to approve the acts of the directors and officers for the period ending October 14, 1959, the motion being made and duly approved.

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The meeting was adjourned at 4:40 P.M.

The Annual Banquet

This was preceded by a cocktail hour, starting at 6:15 P.M., during which a musical background provided an enjoyable atmosphere.

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Doors to the Ball Room were opened at seven o'clock, with 480 men and women in attendance. Following the dinner President Dove welcomed the assembled members and guests and called upon Director Raymond S. Worth to present a Certificate of Honorable Mention (Ferrous Division) to **Dr. Ing. Hans Krautmacher,** Chief of Experimental Station, Westfaelische Union Aktiengesellschaft fur Eisen, Hamm, Germany, for his paper: "Recent Experiences in Shot Blasting Practice."

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The next presentation was made by Vice President **Clement C. Lawson,** who gave a Certificate of Honorable Mention (Non-Ferrous Division) to **J. F. Stoltz,** Engineer, Ironwork & Clearing Products, Rod & Wire Mill, Western Electric Co., for his paper, "Drawing and Insulating Wire in One Tandem Operation."

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President Dove presented the Medal Awards. These went to **Donald K. White,** Foreman, Annealing, John A. Roebling's Sons Corp., for his paper "Continuous Patenting, Cleaning and Coating of Steel Rods" — the best paper in the Ferrous Division in 1958; and to **Harold W. Adams,** Director, Electric Conductor Products, Reynolds Metals Co., for his paper "Fabrication and Properties of 5005 Aluminum Alloy Cables for Overhead Power Lines," considered the best 1958 Non-Ferrous paper.

These papers had been selected by the Awards Committee, headed by Director **David M. Schmid,** and judged by the Oxford System. Such awards are made annually by the Board of Directors.

* * *

Mr. Dove then presented **John Rigby,** the 1959 Mordica Memorial Lecturer, with a certificate memorializing the lecture he had given on the preceding Monday afternoon.

* * *

Tom M. Girdler was asked by Mr. Dove to introduce the distinguished principal speaker of the evening, **Dr. Jason J. Nassau,** who addressed the gathering on "Life in Other Worlds." This talk was illustrated with photographs of the moon, our planets, and other more distant systems. He pointed out that life could not exist on the moon or the planets in our system, but while other galaxies were too remote to determine such possibilities, there could well exist worlds in which life could be sustained. Dr. Nassau is professor and head of the Department of Astronomy at the Case Institute of Technology in Cleveland.

SEEN AT THE CONVENTION

The Michigan Oven — General Engineering Exhibit, featuring The Continuous Coiling Machine developed in England by General Engineering Co., Ltd. Left to right: B. K. Bigland of General Engineering; J. R. Court, their Canadian representative; and C. A. Windsor, T. S. Zelenak, E. R. Meyers, W. Patrick, G. W. Wischow, T. J. Gundlach, C. Percival, Jr., and A. C. Towne, all members of Michigan Oven Company's Staff.

The Plant Inspection Tour
October 14, 1959

Because of strike the scheduled visit to the Cuyahoga Works of the American Steel and Wire Division of United States Steel Corporation in Cleveland had to be cancelled.

The Vaughn Machinery Company in Cuyahoga Falls, Ohio, graciously consented to fill the void by opening their plant to all who would like to see wire machinery in the process of construction.

* * *

About 60 persons took advantage of the opportunity and were transported by two busses to the plant in the morning. The plant was laid out with arrows to indicate the route to be followed, the company's guests following these and being able to stop at any point of interest to view or ask questions of Vaughn personnel along the way.

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The visitors were enabled to see various machining, heat-treating, assembly and other operations and to note the functioning of machines that had been completed and were awaiting shipment. These included their new straightener and cutter, motoblox and ringblox drawing machines, dead block and bull block machines and a variety of accessory equipment.

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The busses returned the Vaughn guests to the Statler-Hilton Hotel about one o'clock. This tour concluded the official activities of the 1959 Convention.

Program for the Ladies

On Tuesday the ladies who came to Cleveland with the men were entertained with an afternoon schedule of visits to points of interest in Cleveland, including the Museum of Art, and a tea as the guests of the American Steel and Wire Division of United States Steel Corporation. Twenty-nine ladies took advantage of this hospitable provision for their entertainment.

The Program Committee

The new program arrangements very generally met with approval and were considered an improvement over the scheduled events of previous conventions.

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No meeting can function without having been preceded by the hard work of a large number of

(*Please turn to page* 123)

Proceedings of the Annual Convention of The Wire Association

OCTOBER 12-15, 1959

CLEVELAND, OHIO

The proceedings are the recorded discussions that followed the presentation of the papers delivered at the technical sessions. Where there was no discussion, no reference is made to a paper. All papers were published in full in the October, November and December issues of Wire & Wire Products.

JOINT SESSION, FERROUS AND NON-FERROUS DIVISIONS

2:00 P.M., OCTOBER 12, 1959

MODERATOR

Allan B. Dove, Development Metallurgist, Steel Company of Canada Ltd., Hamilton, Can.

The Joint Ferrous and Non-Ferrous Technical Session of The Wire Association convened at 2:00 o'clock, in the Grand Ballroom, Hotel Statler-Hilton, Cleveland, Ohio, President Allan B. Dove, Development Metallurgist, Steel Company of Canada, Ltd., Hamilton, Ontario, Canada, presiding. Mr. Walter B. McShane, Convention General Chairman, calling the meeting to order.

CHAIRMAN MCSHANE: Ladies and gentlemen, I want to welcome you here to Cleveland for the 1959 Annual Convention of The Wire Association.

As General Chairman of the Program Committee, it is my pleasure to introduce the President of our Association — Mr. Allan Dove. (Applause)

PRESIDENT DOVE: Ladies and gentlemen, it is always a pleasure to welcome people back to our Association meetings. More so this year in that our first speaker will be the Mordica Memorial Lecturer, Mr. Rigby.

The Wire Association has grown out of all proportion to the original anticipated effect, so much so that we had to change the format this year, and one thing that we do appreciate is your opinions of what the directors are doing. I am not going to say any more about this until a little later when we have The Wire Association Annual Meeting on Wednesday, but I want to remind you just now that there will be a meeting of the Electric Wire and Cable Section at 2:00 p.m. on Wednesday, the 14th, and the Annual Meeting of the Association at 4:00 p.m. the same day, that is, we want to hear from you fellows about what you think of the idea on what we are doing. If you don't approve, that is the time to say so; if you do approve, you can whisper that, too.

Now our lecturer this afternoon is Mr. John Rigby of John Rigby & Sons, Ltd., at Bradford, England, and when I think of John I am reminded of the story about the English chap who sent his son over here and the lad was here for about three years before his father came over, and when the father came over he happened to take him to an embassy meeting in Washington, and when they got up and began to sing "My Country 'Tis of Thee" the young lad sang complete with the American words. The father looked at him with amazement, for the tune after all is the same as "God Save The Queen." The father looked at him and said, "My God, they have brain-washed him."

In this case we have John over here to tell us about what goes on in the specialty wiring for which he is responsible in his firm.

Now a few notes about him. Like many of us, John started his training in the mill and at the age of 18 he was put in the works to learn how people drew wire. On the completion of his training period he was sent to New Zealand and Australia for a year, and then back to the plant again for a while in order that they not brain-wash him, and he would come back to the British.

From 1933 to the outbreak of the war he was Director of Plant Development of the various factories and during that period he made many visits here to the States and Canada, Germany, France, Belgium, and Switzerland, to study the various manufacturing companies. At the end of the war he served on a team known as BIOS. That has nothing to do with biology, but the BIOS Committee went around and studied German industry from the standpoint of the British wire industry and he served as counselor to the British, and he now is one of the elected for the British Wire Trade on the British Iron and Steel Research on the Cold Working Division Panel.

He has been a member of The Wire Association for 25 years and a member of the Iron and Steel Institute, and a member of the British Metals Club Association.

In all this I haven't really told you very much about John. He is a very great guy. He has much that recommended him to be specially honored this year as the Mordica Memorial Lecturer.

I take great pleasure in introducing Mr. John Rigby. (Applause)

MR. JOHN RIGBY: Mr. President, Fellow Members of The Wire Association, and Guests:

First, I would like to thank President Allan for the very nice words he said about me, and to express my deep appreciation for the great honor you have bestowed upon me to give the Mordica Memorial Lecture.

When I received the invitation to give the lecture I thought very deeply about it, and thought for several weeks. I thought at the end I should take it as a compliment to myself particularly because of the subject and our industry here today, and will do my best to give you an interesting lecture.

When I accepted I didn't know what to talk about. I went through the various Mordica lectures since the Association started and I saw in the early days the lectures were primarily technical. Then as the years went by we came into the historical side of it.

Before I start, I would first of all like to pass to you greetings from all the British Association and the British Wire Manufacturing Industry. This summer we had our annual meeting in North Wales and Mr. Rattles made a speech and congratulated me in the meeting on receiving this honor, and he asked me to convey to you the greetings of all its members to the members of the American Wire Association.

(Mr. John Rigby presented "The Manufacture of Precision Cold Drawn Shaped Wire" for the Mordica Memorial Lecture) (Applause)

There is just one thing I would like to do before I go. I have one slide left which is quite interesting. As you people move around this convention you will be getting from various members visiting cards. Now I have a card which I have kept for 26 years which when I was invited to give this lecture seemed to me to be of a very great interest. I brought this card along with me and I had a slide made of it.

(Showing slide of card of Mr. John Mordica, Bethlehem Steel, Sparrows Point.)

PRESIDENT DOVE: I am sure we all appreciate this new point of view, the point of view of precision wire. Some of us think that wire, when it has arrived at a plus or minus half thousandths in our large quantities, we are getting down to the last word. I think that Mr. Rigby has been able to show us that there is still more classified group and more closely classified than any we normally think of in the wire business.

Having played around with shapes, I can appreciate the problem, but we have never got down quite that fine.

I know we all want to thank John for coming here from so far and speaking so well on his particular phase of the wire industry. Thank you very much, John.

Now to go on with the other portion of our program. I should mention that today is a very good day—just think, Yom Kippur, Columbus Day, St. John's Day, so we are really having a big day. That reminds me of the story from Houston, Texas, of the rabbi who received a letter from a

bridegroom he had recently married and the letter read something in this fashion: "Dear Rabbi: I want to thank you for the beautiful way in which you brought my happiness to a conclusion." (Laughter)

PAPER: "Manufacture of Wire Products — Oven Racks, Baskets, and Refrigerator Shelves" — by F. B. Thacker, Bauer Bros. Co., Springfield, Ohio.

MR. THACKER: Members of The Wire Association: I feel a little bit like a fish out of water today, the fact that I am talking to a group that specializes in the manufacturing of wire and I am just a wire product vendor.

We specialize very much in the manufacturing of ovenracks and refrigerator shelves and freezer baskets, which applies specifically to the appliance industry, which is a very major portion of our economic life.

Our manufacturing is just a very small segment of the overall use of wire in this country. I think if all of you would stop to think about it, probably upon your person today you have something made of wire, whether it be nothing more than a spring in your watch, so you can see there are thousands of items made from wire.

We have specialized ourselves, as I said before, in the appliance industry whereby we supply most of the major appliance manufacturers, namely, such products as I think most of you are familiar with, such as Frigidaire, General Electric, Tappan Stove, Philco Corporation, and the like.

I am going to attempt to illustrate our methods by means of slides today and I think most of you will probably be quite familiar with the techniques that are applied, but we do feel we have some unique methods.

When I say that we have confined ourselves to some high production work, it does not mean that we can run any one item on continuous basis, so the equipment that I will show you today has to be extremely versatile. It is necessary that we be able to tear down and set up any one piece of equipment within a very short time because even though we might run, say, one ovenrack or one basket in the amount of possibly 300,000 or 400,000 pieces in a year, our customers do not run that one particular item in their line of production on a continuous basis, consequently if we are lucky we might be able to have an opportunity to produce one item in lots of maybe 25,000 to 30,000 pieces. Normally, though, it is usually confined to run in the 5,000 to 10,000 category.

As you probably know, most of the appliance industry in the past few years has been very depressed, particularly from a profit standpoint, and naturally, we have been called upon to produce at a lower cost, which means naturally a very narrow profit margin, and we have to be quite ingenious both from the engineering standpoint, from the design of the basic item as well as the design of the equipment, because that is the only way that we can exist.

(Mr. Thacker presented his paper)

It has been a pleasure to present this to you. If any one has any questions, I will be more than glad to try to answer them for you. Thank you very much. (Applause)

MR. DOVE: Well, gentlemen, the meeting is open to qquestions. First, I have one, Mr. Thacker. I was wondering how do you order your wire finish for plating?

MR. THACKER: Our plating requirement for the type of wire that we buy is generally listed as being extra clean, bright wire, and we naturally pay a premium for that type of material.

Again, I think I mentioned that we experienced some difficulties in obtaining the material that is actually clean enough and smooth enough to give us a consistent material with which to plate and say to our customers day in and day out that we can meet a stringent specification. That is one of the reasons why we have worked with some of the field companies and the American Steel and Wire and Youngstown Sheet and Tube, in an effort to effect methods of drawing and obtaining a consistent finish. Also, with plastic Corvel finish I mentioned before we can use ordinary fence wire if we had to.

MR. DOVE: Any other questions, gentlemen?

MEMBER: I should like to ask the speaker whether he has had any request for aluminized wire.

MR. THACKER: I will answer it this way: We have had but we have not done too much with that. We have experimented quite a bit with strictly aluminum wire by trying to weld it by resistance welding methods. We have never quite been successful yet on an economic basis to be competitive with someone who would take a piece of sheet aluminum and stamp it or someone who would take aluminum wire and actually by cold heading and putting it into a strip part come up with what we call a fabricated aluminum shell wire on the market today. But the only way we feel we could enter that market would be to successfully resistance weld aluminum. We can weld it but we can't do it economically.

MEMBER: I would like to ask about the costs of the fluidized process.

MR. THACKER: At the present time the cost of the fluidized bed process falls pretty much in this category, making cost comparison: The cheapest finish to apply is actually the zinc finish with the Ebon lacquer backer. The next is the copper nickel chrome with the Ebon finish. Then the fluidized bed finish comes next. That is one of the interesting aspects of this Corvel finish. At the present time we are below the cost of any type of aluminum shelving for refrigerators. Using purely a hypothetical case, a one dollar price for an aluminum shelf, we could produce a wire with a zinc finish at roughly sixty cents, and with the copper-nickel-chrome it would run in the neighborhood of seventy cents, and with the Corvel finish about eighty-five cents.

The biggest cost of this Corvel finish happens to be at the present time the raw material. We are, for example, paying for a polyvinyl material approximately one dollar and ten cents a pound. That is roughly forty per cent too high, but I think as time goes on and more uses are found, as in any new item, that the cost will gradually slide downward to a more workable figure.

MEMBER: What thickness of coating do you apply in the fluidized?

MR. THACKER: That is one of the best parts of that system. For example, the best material for our specific use happens to be the vinyl, and we are able to give a consistent coating without any sags or any drips, 10 mills to 15 mills. We can go higher than that, up to a maximum of around 30 to 35 mills.

MEMBER: Can you go thinner?

MR. THACKER: Not and give a complete coverage. You can go thinner if you have a mass of material that is completely consistent. For example, if you try to coat an article out of wire, say, where you have a 5/16 frame wire and you have a 3/32 diameter filled wire, there is too much difference because the process is essentially that you must pre-heat a part in the neighborhood of 450 to 500 degrees Farenheit and the time that it takes to remove from the oven into the fluidized bed you have such rapid transfer of heat in the small wires and the large retention in the big wire that you can't put on a thinner coating more than I gave you, 10 to 15 mills.

MEMBER: Does it require any coat to promote bonding or is it just a covering?

MR. THACKER: Yes, with most all of your plastic finishes it is necessary to apply a primer whereby your primer gives adhesion to steel and also to the plastic. Part Vinyl or zylostic materials or nylon — none of those have any adhesion to raw metal. Most of those primers are variations of epoxy.

MR. DOVE: Are there any other questions? Thank you very much. (Applause)

PAPER: "The Impact of Modernization in Wire Weaving," by T. L. Stilwell, Warner-Swasey Co., Cleveland, Ohio. The paper was presented by H. P. Balsom in Mr. Stilwell's absence.

MR. H. P. BALSOM: Thank you, Mr. President, ladies and gentlemen of The Wire Association.

A little over a month ago Tom Stilwell called me into his office and said he was going to attend a textile show at Milan, Italy, and mentioned the possibility of my having to present this paper for him in the event that his itinerary kept him in Europe. As he progressed in his travels throughout Europe, it became quite evident that he was going to be here, and I would not have to present this paper. However, last week late, I received a cable from Tom and he said, "Will return to Cleveland to attend The Wire Association convention. You present the paper." (Laughter)

So if you will be kind enough to bear with me, I will actually read Mr. Stilwell's paper and hope that we can give you somewhat of an idea of what we are trying to accomplish at Warner and Swasey here in Cleveland.

In checking over Mr. Stilwell's paper, I find he has broken it down into three sections: No. 1, giving a brief description as to why Warner and Swasey have gotten into the wire weaving industry; No. 2, a very brief description of the machine; and finally, the actual impact of our equipment in the wire weaving industry.

(Mr. Balsom presented Mr. Stilwell's paper.)

PRESIDENT DOVE: Questions, gentlemen?

MEMBER: At what rate of speed does this machine operate?

MR. BALSOM: The machine operates at a speed of 240 beats per minute or cycles per minute. In other words, we are taking the shute wire across the machine 240 times per minute, which means the shute wire itself is traveling over on the spool at the rate of 30 feet per second. That is against a speed of approximately 60 beats per minute on the conventional wire weaving loom.

We have Mr. Swetlin of our Service Department along with me today.

Mr. Dove has asked the question about specifications which are required in getting our machine to perform satisfactorily. Mr. Swetlin is in the Service Department. He

makes them run. Ray, if you will be kind enough to answer that question, I would appreciate it very much.

MR. SWETLIN: The main specifications that we ask for are that we want wire that runs. I believe Mr. Balsom in his talk referred to one of our complaints and that is that we don't believe there are any sufficient tests available at this time to accurately measure the surface conditions of wiring. If there are any people here that can give us some ideas on that, we would be very happy to try them out. Up until now, the only thing that we have been able to do is take the wire and try it out and from that the people have been able to go back and set up their procedures accordingly. I am afraid that is as specific as I can be.

MR. DOVE: Thank you very much. (Applause)

MEMBER: It seems to me to be implied in this paper and the last speaker's remarks that there is a need on this loom for shute wire with some special but unidentified characteristics which will allow the wire to flow from the full spool to the last turn on the hub freely and uniformly if the loom has to realize its productive capacity.

The emphasis has been placed on the wire surface as a major and variable factor in the performance of the wire on the loom. Now, this problem of wire surface or skin character is important in many fields of wire use. It is generally recognized but not readily defined or measured and in many cases it spells the difference between the success or failure of wire applications. Perhaps the speaker's group may be able to devise some singular measure which may qualify a wire surface and put a number value on it for us which we can measure.

To do this I suggest first, that there be kept in mind the separation of the intrinsic properties of the wire skin or surface from the attending circumstances which may affect the behaviour of the wire in such a manner that their gross effect may appear to be a surface condition of the wire. Amongst these are such things as lubricants on the wire, cast, curls, kinks, chafing in spooling, tension differences in winding, etc.

In attempting to analyze the surface condition as a product intrinsic to the wire I suggest they might try to measure (1) surface roughness, (2) the coefficient of slip or friction of the wire as affected by surface, (3) the surface tension effects or capillary character of the skin. There are tools available to do this but, no doubt, technique and methods will have to be developed for wire purposes. At any event, I am suggesting, as he has requested, these possible approaches to the problem as a starting point from which the speaker may proceed.

MR. DOVE: Thank you very much.

ELECTRIC WIRE & CABLE DIVISION DISCUSSIONS

9:00 A.M., OCTOBER 13, 1959

MODERATOR

James E. Flood, Technical Director, Plastic Wire & Cable Corp., Jewett City, Conn.

PAPER: "Facilities for Wire Irradiation with an Electron Beam Generator" — by R. P. Skundberg, X-Ray Dept., General Electric Co., Milwaukee, Wisc.

MR. FLOOD: Does anyone have any questions regarding the Electron Beam Generator?

MEMBER: What is the level of ozone concentration in your room?

MR. SKUNDBERG: We haven't measured it but from what I have read, — well, again, it depends on the ventilation system but it can get up to as high as probably three or four parts per million if you don't have a good ventilation system. The safe level now I think is point one parts per million. Of course, this again varies from state to state and will also vary on whether people are going to be there on eight-hour day, 40-hour week or just going to be in there three hours a week.

MEMBER: Due to the curvature of the wire, do you have to repass this material through the main because of the difficulty of getting uniform penetration?

MR. SKUNDBERG: Generally, the wire is strung back and forth through the beam so if you may call one time the top side, the next time it is down under, you are hitting it actually from two sides. If you have a very small wire you don't have any problem if you get into one-inch O.D. You might have a problem with the one million volt machine, whereas, you wouldn't have it with the two million volt machine.

MEMBER: In your cost breakdown do you include overhead or burden in this analysis?

MR. SKUNDBERG: No, I have tried to make this as simple as possible. Of course, the accounting system can vary with each company, and it was fairly hard to set it up, so I made as general a statement as I could.

MEMBER: The only attendant is the operator?

MR. SKUNDBERG: That includes the operator and one other; you can call him a technician or process supervisor.

MEMBER: Could you give me an idea how a processing rate might vary with thickness of installation for no process?

MR. SKUNDBERG: If you have, let's say, about a No. 18 wire, I think that has a very thin insulation — I am not very familiar with it — this can probably be run through. I think it has a diameter of about an eighth of an inch. If you get eight per inch — I am assuming a beam 12 inches wide — you get eight times 12 strings back and forth. If you were running quarter inch, you would only get four to an inch and running through the beam actually less times. Therefore, you would either have to go through slower or run it through again later to get the total amount of radiation.

MEMBER: Ten feet per minute or 100?

MR. SKUNDBERG: Here again it varies. It is fairly hard to say without actually getting down to cases. Some wire has been run at around 80 to 100 feet per minute. Again, in other cases we have been down to 20 to 40 feet per minute. It largely depends on each individual type of wire.

MEMBER: Are you talking about polyethylene? How about vulcanization of rubber? Is the speed about the same?

MR. SKUNDBERG: That is getting a little out of my line but I think the cross linking of polyethylene and vulcanizing of rubber would probably require about the same dose, maybe a little lower. I am not too sure. I wouldn't put much faith in that statement.

MEMBER: You mentioned a two million volt generator. What type of machines are in operation today or are there any in commercial use for wire?

MR. SKUNDBERG: There are a few installations, probably the most prominent and famous are the two on the west coast at Redwood City, California, the Raytheon Corporation and Sequoia. They started in the business I think about three or four, maybe five years ago.

MEMBER: Are they using two million volt generator?

MR. SKUNDBERG: No, they are using one million, I believe, although they may. I think they are using one million now. Of course, if they want to go to thicker wire, and perhaps they have already, they would probably have to increase their voltage and buy a different machine. Of course, they have one million to run the smaller wire. They could use the two million for the larger wire.

MEMBER: Is the insulation melted or heated up considerably by the reaction?

MR. SKUNDBERG: About the only time it is melted is if the process jams. As to the heat produced, I don't have the exact figures. It depends upon the density but I think Dr. Laughton of the Research Laboratory came up with a number of about two degrees Centigrade per one million brad. Of course, the wire will be moving so there will be a massing of air over it so this temperature may be reduced. I would guess it would probably be between 20 and 30 degrees Centigrade above room temperature.

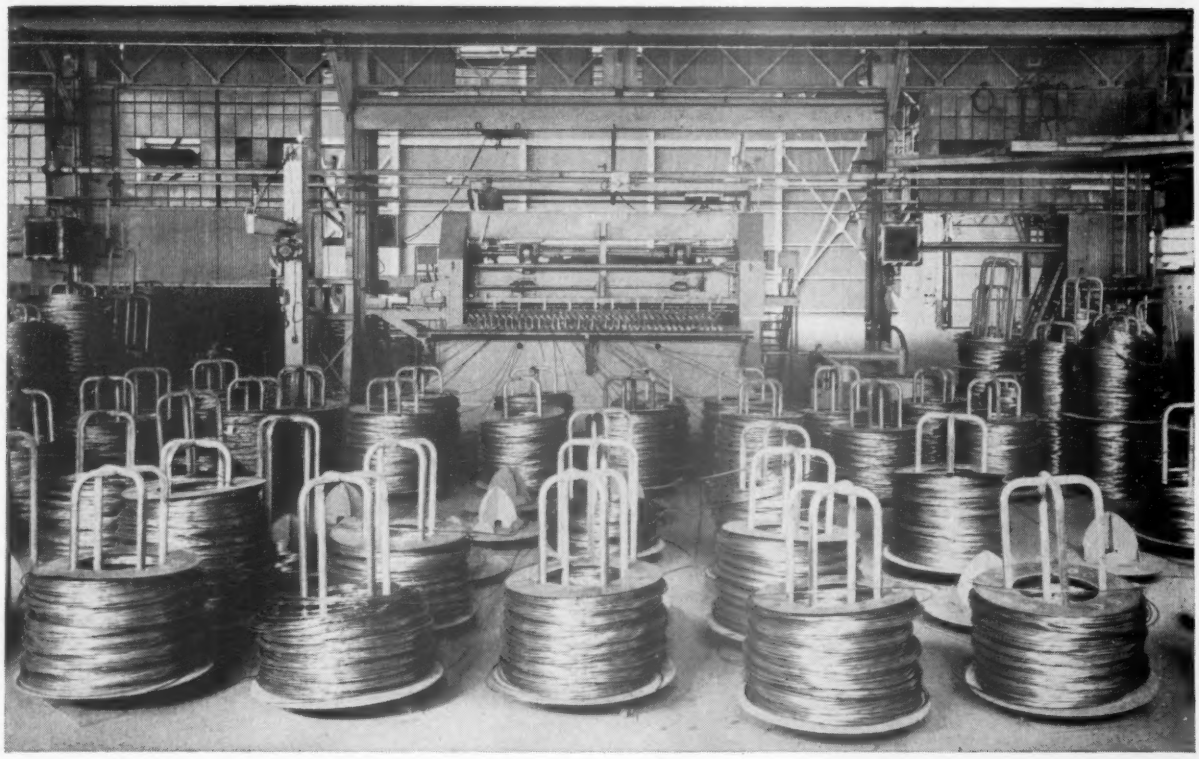
MEMBER: What materials are being treated in this fashion?

MR. SKUNDBERG: Most of them are variations of polyethylene. That is about all I know. Each company has its own secret process or compounds they make out if it. The basic product is polyethylene to start with.

MR. FLOOD: Thank you, Mr. Skundberg. It was a very interesting paper.

PAPER: "The Use of Irradiated Polyethylene in Wire and Cable" — by A. N. Towne, Insulating Materials Dept., General Electric Co., Schenectady, N. Y.

MR. TOWNE: This paper is a little different from the previous one in that we are dealing with irradiated films rather than irradiated wire, and the use of this film on wire.



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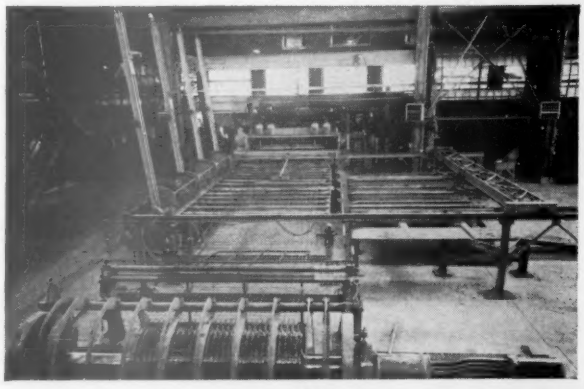

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(Mr. Towne presented his paper)

MR. FLOOD: Do you have any questions for Mr. Towne?

MEMBER: Do you use unpigmented stock?

MR. TOWNE: In the cracking experiments we compared the cracking of unpigmented polyethylene. As you know, you can't use unpigmented stocks for weathering applications.

MEMBER: Have you made any comparisons on the usual black types of materials in irradiated?

MR. TOWNE: I can't answer that truthfully. I believe they have been made. I don't have any data to prove that.

MEMBER: There is much interest in the use of highly carbon loaded, 100 parts of carbon to 100 parts of polyethylene for cable jacket and other uses. Have you had any experience in that?

MR. TOWNE: We have not only added highly-loaded carbon irradiated materials for uses, but put some of these materials out to the various cable companies. We haven't done much in the past year. The response has been of not too much interest, mainly, I believe, because of the higher price. We have such a material.

MEMBER: Does this material heat after heat seal?

MR. TOWNE: It can be made to heat seal.

MEMBER: After you have shrunk an oriented irradiated polyethylene, does the crack resistance drop, and if so, how much?

MR. TOWNE: I can't answer that. I don't know.

MEMBER: It didn't seem to change as far as we were concerned.

MEMBER: How thick a material are you dealing with here?

MR. TOWNE: Well, we have a two mill, five mill and the ten mill on the unoriented and a four and eight on the oriented.

MEMBER: What is the basis of your saying that the inability of the material to melt and flow is a deterrent to carbon crack?

MR. TOWNE: Well, this is only a guess as to why it is so. We don't really know. That is, the person who investigated guessed this is the reason, but we really don't know.

MEMBER: Even though the neoprene didn't show poor cracking?

MR. TOWNE: That is right. Maybe we could be wrong.

MEMBER: You qualified the application of this power cable as being applicable to low voltage cable. Could you expand that qualification, please?

MR. TOWNE: Well, I don't think it is we who are selling the material that would keep it in the low voltage range. I think it is the cable manufacturers themselves. I don't believe any cable manufacturer has been making high poly voltage cable in the low voltage range. You perhaps know better than I.

MEMBER: We have experimentally.

MR. TOWNE: This must be applied and it takes time. We have been making successful cable through 15 k.v. We do not believe, as we see it now, unless there is some way of being sure that each wrap is integrated to the underlying wrap, that it would be safe to mark as a high voltage cable.

MEMEBER: One more question: How is the degree of cross-linking determined and controlled?

MR. TOWNE: It is controlled by dosage. I guess it is determined by the molecular weight, and there has been a lot of work done on this in the past by a research laboratory.

MEMBER: Does the process apply equally to low density and high density polyethylene?

MR. TOWNE: We have done it to the high density to a limited extent. We do it to the point of stress cracking at the high density.

MEMBER: Even stress cracking?

MR. TOWNE: We didn't work on it long enough to find out how to do it. That is right.

PAPER: "Chemically Cross-Linked Polyethylene for Wire and Cable — Progress Report" — by Michael M. Suba, Union Carbide Plastics Co., New York, N. Y.

MR. FLOOD: Do we have some questions for Mr. Suba?

MEMBER: Mike, can you tell me what abrasion test was used for those figures you showed?

MR. SUBA: No, I don't know what it was.

MEMBER: If I remember correctly, you had a slide which showed a rather drastic decrease and specific, and you added your polymer.

MR. SUBA: It wasn't so drastic.

MEMBER: What would be the increase? You are destroying the crystallites. I was curious as to why the gravity decreased.

MR. SUBA: I think the second slide will show it. I will let you look at it later.

MEMBER: Have you accumulated any aging data with respect to the residual changes in the chemical cross-linking?

MR. SUBA: With respect to the residual changes, you mean what happens after? We pointed out the aging properties were excellent.

MEMBER: Over what period of time?

MR. SUBA: Admittedly, we haven't been too active in this area for a long period of time. Our work has been conducted over a period of about a year.

MEMBER: What about the use of mineral filters? Have you been active in this area?

MR. SUBA: We have reported to you on all the work we have done; we haven't included mineral filters.

MEMBER: Can you tell us something about what type of extrusion techniques are necessary to apply these materials?

MR. SUBA: Mind you, all this work has been done on pressed plaques. We have done considerable exploratory work on wire, extruded shapes and particularly pipe, since this is a good potential market for chemical cross-linking polyethylene. I think we are a long way from telling you exactly how to do it. Our work now is fundamental to show you what happens. We can make these changes.

MEMBER: Have you ever encountered any film?

MR. SUBA: Not chemical.

MEMBER: Is there any change in the tear resistance of this material from the normal polyethylene?

MR. SUBA: Yes, there is a substantial improvement, although I can't ascribe a number to it. It becomes very rubbery.

MEMBER: Mike, have you done any work on cut-through resistance of this material?

MR. SUBA: Yes, that is the one property in which we are very interested.

MEMBER: Is that high density polyethylene?

MR. SUBA: It is a different kind of cut-through resistance. I couldn't make a comparison. I would be conjecturing.

MEMBER: What was your basis for choosing four parts of dicumyl per hundred polyethylene?

MR. SUBA: Our work went all the way from zero up to eight parts, and your question is why did we choose four parts. In our preliminary work there didn't seem to be any advantage beyond four parts.

MEMBER: Was there any advantage to under four parts?

MR. SUBA: The range seemed to be between two and four parts.

MEMBER: Does the chemically cross-linked material have the same shrinkage properties after elongation that the irradiated material has?

MR. SUBA: You mean the same recovery properties? Much better recovery properties.

MEMBER: Did all this work contain an antioxident in the formulations?

MR. SUBA: We didn't report on the effect of antioxidents. We have made such studies — this work did not, but that is a very important aspect to chemical cross-linking.

MR. FLOOD: Any further questions? Thanks very much, Mike. You did a fine job.

I will close the morning meeting with my thanks to the three authors, Mr. Skundberg, Mr. Towne and Mr. Suba, for their efforts and work in preparing these papers and thank them on behalf of The Wire Association as a whole.

2:00 P.M., OCTOBER 13, 1959

MODERATOR

Urbain J. H. Malo, Technical Director, Narragansett Wire Co., Pawtucket, R. I.

PAPER: "Thin Metal Strips for Sheathing Telephone Communication Cables" — by H. N. Padowicz, Cable Development, Western Electric Co., Kearny, N. J.

MR. MALO: Thank you very much, Mr. Padowicz. I don't know how many questions we can dig up in view of the fine detailed explanation that has been given to us, and yet, I think discussion points that may not have been covered are in order, and questions at this time are definitely in order.

MEMBER: How long can you make one of these cables uninterruptedly?

MR. PADOWICZ: We have some cable down to one-half inch, about 8,000 feet long. When they get up to two and a half, they are about 1,500 feet in one continuous length.

MR. MALO: That was a fine paper, Mr. Padowicz, we appreciate that presentation.

PAPER: "Bonding Characteristics of Insulating Varnish and Wire Enamel Systems" — by Donald L. McClenahan, Schenectady Varnish Co., Schenectady, N. Y.

MR. MALO: Thank you, Mr. McClenahan. We can now expose Mr. McClenahan to questions.

MEMBER: Is there a relation between free phenol and your phenolic bonding and adhesion?

MR. MCCLENAHAN: May I ask you what do you mean by the free phenol?

MEMBER: If you have a phenolic varnish and your basic, when you get complete baking you are going to have free phenol. Does that influence adhesion?

MR. MCCLENAHAN: In an insulating varnish you will have a phenolic aldehyde. You will have some phenolic tending to be driven off. Actually, I can't answer that, whether the free phenol will have a decreased effect on adhesion. We know as you continue to cure, continue to drive off more excessive phenol or formaldehyde, your strength will increase.

MEMBER: My point was, there, would there be some testing for free phenol and you could more easily test the free adhesion in water in a phenolic varnish.

MR. MCCLENAHAN: I think you would be able to tell when the varnish was properly cured, which may be a measure of the amount of free phenol that is eliminated. I know that is a rather ambiguous answer. Does that satisfy you?

MEMBER: No, but it is all right.

MR. MCCLENAHAN: Perhaps a chemist in the audience could help us out. I am just an electrical engineer.

MR. MALO: Is anyone willing to volunteer an answer to that pointed question?

MEMBER: We believe it does.

MEMBER: Is the coil test a standard test or was that developed by Schenectady?

MR. MCCLENAHAN: It was to a degree developed by the Schenectady Varnish Company. Actually, I don't know who developed it. It was written and described by John Dexter, of Dow Corning about the fall of 1955. There have been a number of similar tests to that, but I think Dexter was the first who really wrote it up in a form which is now being used almost exactly as he wrote it, using a quarter inch mandrel and an inch and a quarter test specimen of 18 wire, but much of the initial work was done in A.S.T.M. and A.I.E.E. Committees as an attempt to secure a curing method for silicone varnish. It didn't particularly prove out for silicone varnishes but has worked out nicely for other types of varnishes.

As I said, it is now being investigated. The most recent interest I think is in finding the bonding strength in freon system for hermetic motors. There is a lot of interest in trying to make a test in a bomb to determine the bonding strength after the wire and varnish are subjected to freon and high temperature and high pressures.

MR. MALO: Any further question? Thank you, Mr. McClenahan. (Applause)

PAPER: "Catalyst Applications to Continuous Strip Ovens" — by Richard J. Ruff, President, Catalytic Combustion Corp., Detroit, Mich.

MR. RUFF: Thank you, Mr. Malo, Members and Guests.

I forgot my paper. Besides, you will find it in the current issue of the Wire and Wire Products.

I am glad Mr. Malo brought up the point that I have been professor in an engineering school, because I want you people to know that we use purely academic means in the development of the catalyst for the application in the wire enameling and other related industry.

We get the same approach that the professor did who was testing the psychological reactions of fleas. He first had to get some dogs to select a certain breed of fleas that had sufficient mental capacity so they would do exactly what he wanted them to do, but eventually he did that, and he separated them all so he got this high quality group of fleas and then he began his experiment. He got them to the point where they would obey his signals, and he had ten fleas all of the same mental capacity. He would put his finger down there and say jump, and that flea would jump over his finger. He kept that up until the ten had jumped over his finger, and he began to record his notes and observations.

He picked up his scissors and snipped off two of the legs of two of the fleas and he began the experiment again, and this one flea jumped over, and so on, and they all obeyed the signals, so he recorded his observations. He did this to the second pair of fleas and after the second pair he went on until he got to the final pair of legs, and he snipped those off and then he said jump, and of course, it jumped. He did this with all ten, and then he simply recorded his observation: "When all legs are removed from the flea he loses his sense of hearing." (Laughter)

We noticed in some of our own observations as we went along in some of our early test work, our observations were probably just about as far off in the actual true physical or chemical phenomena.

MR. MALO: Thank you very much, Mr. Ruff. It is obvious that while Mr. Ruff has moved along, his company has obtained some of the benefits of platform technique that he used while a professor for 11 years. I was a little aware of it with mixed emotion. I won't mention which professor was the one that tried the hardest to flunk me.

Now I presume you are ready to throw some questions at him, which I am sure you are ready to answer.

MEMBER: Could you tell us something about the field cleaning of the catalyst?

MR. RUFF: I can tell you a lot about it. We have done quite a little field cleaning of catalysts in an endeavor to provide a means that would be reliable under all cases of contamination. Unfortunately, we haven't been able to find that. Let's look at it this way: If you have a coating of sand, cinders or inorganic dust, it simply provides a surface coating. Now that type of coating can easily be washed off with a solution of Vel or Dreft or similar synthetic detergents; it is hot soap solution, immersion washing, and then rinsing and reinsertion.

If iron oxide comes to you as particles of rust, and we can get those in conveyorized ovens, and there is a constant wearing of chains, then you will have iron coming up as one of the contaminants. That type of contaminant is rather easily washed off with a 20 per cent nitric acid emersion washing.

Copper is another. At every start-up and shut-down you will have some copper coming off and coming to the catalyst simply because you are burning wires, and so you are vaporizing some copper on the wires that are in the oven. So we usually find copper in our spectrographic analyses as a catalyst is returning from wire-handling operations. That is readily removed by the nitric acid treatment.

There is another type of contaminant that isn't readily removed and that requires a degree of caution here. Let us assume that in the oven or heater structure, the preheating media you use has burner baffles and the burner baffles are close to the burner itself, and eventually are burned off. We think what is happening is the action of the flame on iron causes iron carbon needles to form, and when it comes to the catalyst it does exactly what it is supposed to do, that is, form hydrogen-carbon iron in the hydrogen phase. When it is burned it deposits iron oxide directly in the pores of the catalyst and they are not readily removed. So it is simply a precaution when using catalysts, to be sure that the heating medium you use ahead is arranged so that you are not burning off baffles or vaporizing metals.

I might point out, too, that catalysts must be used for burning hydrocarbons organic. Silicone is made of hydrogen carbon and silicon, the product of oxygen, and produces water vapor; with silicon dioxide your catalyst will keep right on burning a silicon vapor until the catalysts are coated. They will be coated with silicon oxide. You don't use a catalyst when you are baking a silicon enamel on wire, because it will result in a rapid deposition of silicon dioxide. We would call that a coating agent.

Now there is one other, and it is very rarely met in the wire enameling industry — types of hydrocarbons to avoid — organic phosphate. It may be used as a plasticizer in certain types of products that are impregnated in fabric. The plasticizer of the organic phosphate will cause a deterioration in very much the same manner and is difficult, if not impossible, to remove. It requires return of the catalyst for stripping and the reapplication.

MEMBER: Would it be dangerous to attempt to clean your catalyst element using a solvent 1-E and tend to catalyze inside the element?

MR. RUFF: In general, no. That depends a little bit on the solvent.

MEMBER: Toluene?

MR. RUFF: It can be immersed in toluene. Do not immerse it in hydrogen peroxide because the catalyst destroys the peroxide. The catalyst has a reaction on hydrogen, for instance, at room temperature, hydrogen peroxide at much lower, but with naptha vapors in general you would immerse it rather rapidly and wash it out. Now, actually, you have seen cigarette lighters where you simply pull the cap off it and begin to drag on the cigarette, and the catalyst in there begins to flow. You have a condition there quite different from any dynamic system for fume elimination. First, with methyl alcohol, which is low ignition, you have an extremely high, above the flammable region, so the heat of absorption will bring that catalyst pellet up to the point where heat of combustion takes over, and then it burns. Normally, the space relation to mass is so great, that this won't even occur on methyl alcohol. So you would be perfectly safe in accomplishing immersion washing with ordinary naptha.

MEMBER: If you were to install a burner, let's say an "I" oven, would you expect there would be sufficient fumes with all sizes of wire to maintain the burners?

MR. RUFF: The question is, if one of the units as illustrated here were installed on a G.E. "I" machine, would we have enough energy available to run this unit on a self-sustaining basis with all electric footage, with the off position with all wire gauges and all enamels? Is that it?

MEMBER: Yes.

MR. RUFF: No, it wouldn't. You have an extremely wide range that can be baked in our machines. You can have a solvenous enamel which has only a small trace of hydrocarbons, which are replaced during the operation. That would demand continuous pre-heating. The next we would say is the black enamel, where the solvent is about 40 per cent of the enamel, and the coating thicknesses somewhat less than on the formasite or isonel type of enamel. So the amount of gallons per hour released under that condition might be quite low.

Then we go from there all the way up to the very good possibility of reaching as high as three gallons per hour with maybe a 22-gauge wire running with nylon or one of the high solvent load; so we have here a range from virtually nothing to as much as three gallons an hour.

I would say that unit for an "I" machine perhaps should be self-sustaining at something over three-quarters to one gallon per hour. If you are below that, you are going to have to continue preheating. If you are above that in the "I" machine range, it would be on a self-sustaining basis.

MEMBER: This actually happened. using the same enamel in size — .000026 and .0035 — it performed very well. As soon as we went to 179 we couldn't sustain the combustion. We had to raise the temperature.

MR. RUFF: Well, I think you are referring there to perhaps one of the design errors or to a minor error in initial adjustment. Those preheaters initially on some of the early jobs, we were cutting off our preheat at 600° catalyst discharge. We found this was too low. If you had a very low solvent load you never quite went over. At your upper 600° you are doing a partial job and the heaters would knock and you would be down here and it would build up and do that all the time. Simply by raising the cut-off point on the preheaters to about 700° you are able to get over the top, and from there on do a burning job.

MEMBER: You are saying by that that you want to maintain by external heat supply or power supply enough to at least maintain 700 degrees rather than something lower?

MR. RUFF: Your question is that that infers that we want to maintain at least 700 degree temperature on the catalyst rather than lower temperature.

By 700 degrees I did refer to the catalyst discharge temperature, and I think that is correct. At 700 degrees you still may have only 500 degree entry temperature. On the low solvent loads you have that problem of getting up to the point where the heat exchange from that unit will give you enough preheat so your heaters can come off, so your catalyst entry remains above 550 to 600 degrees and your catalyst discharge goes into the range of 800 degrees or so, and then you have stable conditions.

However, I don't want to infer that this means it is necessary to run at these elevated temperatures under all conditions of operation, because when you go to maximum solvent load we force the catalyst load down to maybe 450 or 500 degrees and control with catalyst outlet 975 to 1,000. More work in that direction has been done in the metal lithographing industry where baking of tin plate involves the baking off of fumes of somewhat similar nature, and we find that the catalyst entry temperature, of course, is inverse. The needed catalyst is inverse to the catalyst discharge temperature. In other words, let me draw this figure here. Way up there was 550° to 600°, not 440°. Let's say under no solvent load, catalyst entry and catalyst discharge are virtually the same. Now when we begin to produce a solvent load and catalyst discharge begins to ride upward, then catalyst entry temperature can be permitted to drop down, and you will still sustain complete oxidation, so that if this is temperature, you will see that as the catalyst discharge goes up, entry temperature can go down.

There is a limit to how low you can go and the limit appears to be the temperature at which air-borne droplets or aeresols are formed, because if an air-borne droplet strikes the catalyst instead of a pure gas, it forms a carbon residue. So that on wire enameling operations, we never permit this to go below about 475° F., or so. If you are vaporizing a pure naptha or gasoline vapor and consuming it by catalysis, you could allow this to go to essentially the room temperature down to the place where it would remain as a gas phase.

MR. MALO: Any further questions?

I want to thank our three speakers this afternoon for the fine job they have done and extend to them your appreciation as well as my own.

9:00 A.M., OCTOBER 14, 1959

MODERATOR

Clement C. Lawson
Plant Facilities Engineer
Bell Telephone Laboratories
Murray Hill, N. J.

PAPER: "Production and Laboratory Control of High Quality Polyvinyl Chloride Compounds for Wire and Cable Insulations and Jackets" — by Q. R. Ball, Cable Engineering Labs., Wire & Cable Div., Northern Electric Co. Ltd., Lachine, Que., Canada.

MEMBER: Could you tell me what the range of temperature control is of the air that is going into the speed muller and what the capacity of the speed muller is in conjunction with it?

MR. BALL: The air, as I mentioned, is admitted at 380 degrees. Your control can range anywhere, depending upon your damping of your air admittance or the temperature at which you operate your boiler. It can be reduced if you so desire. It usually varies but if it is operating properly, it stays right on the 380. It can range from 360 to 400, I would guess. There is a thermometer on the inlet section of the muller, and if that temperature tends to sneak up much above 390, then it indicates it is time for a cleanout prior to your regular operation. You are getting holdback of your compound, which is undesirable.

The size of the batch, I believe was your next question, and that is in the neighborhood of 175 pounds — between 170 and 175.

MEMBER: Does your compound extruder have any special features which differentiate between the regular commercial features, such as screw design, and in order to get the required intimate mixing?

MR. BALL: No, what we were trying to point out in our compound extruder, is that we don't want to have to put any more work than we absolutely have to into it. The lower your heat history, the better the compound, and all you want to do is just merely flux your compound as long as you get your necessary output.

Now, oddly enough, this screw has a fairly low L to D ratio. It is only 12 to one. It is about 100 inches long, but we feel we can get higher outputs; as a matter of fact, we have had higher outputs than we are currently getting. The only restriction is that our incentive department says we are working a fellow too hard if we turn out a higher output, so we have restricted our output to the level I mentioned. If it should become necessary to consider the addition of more equipment, then we would consider the economic aspects of adding a second operator and increasing our output rather than an additional mixing unit.

MEMBER: What was the compression ratio of that screw?

MR. BALL: I believe it runs around three and a half or four to one.

MEMBER: Constant depth and constant pitch?

MR. BALL: Constant depth with a decreasing pitch of about 24 inches.

MEMBER: Do you have a working pit at the end of the screw?

MR. BALL: Yes.

MEMBER: Why was it necessary to go through the compounding operation? You mentioned that in summertime in the moist atmosphere it tends to pre-dry.

MR. BALL: You mean rather than use a straight dry blend compound. We have successfully run a good many thousand pounds of straight powder blend extruders, but when you have quite a few extruders the control of conditions over which you get a satisfactory compound extruded can vary quite widely. In other words, to try and control the operators on each of these machines to make sure they didn't incorrectly operate their screw speeds, these are all specified by instruction. To insure that they didn't operate on the conditions which would produce porosity, we felt it was easier to go right back to the source and give them compounds with which they would have no trouble in turning out anything but good solid insulations.

MEMBER: Do you run infrared tests on every batch that you produce?

MR. BALL: No. That is, a complete infrared analysis on this takes in the neighborhood of two hours.

MEMBER: You indicated you use it for control.

MR. BALL: It is control checking. As I say, you can produce a batch in anywhere from six to ten minutes and it takes two hours to analyze it, so it is just not feasible. We do run a spot check on these materials and, as I mentioned, the specific gravity we feel and the constant look at our conditions is the most important control factor.

MEMBER: On a pound per pound basis, how great a savings do you realize doing your own blending?

MR. BALL: Appreciable.

MEMBER: Of what magnitude?

MR. BALL: Secondary order. (Laughter) Actually, it is well worth while. I am afraid I can't give you any details on it, but it is certainly a most attractive process.

MEMBER: Five to ten cents a pound?

MR. BALL: Well, you can take what you like. I am afraid I can't tell you that.

MEMBER: Do you ride the extruder strip after the cooling operation?

MR. BALL: Yes, we do. It is run through rollers and over a roller, and there is an air flow off the strip, which does a very good job.

MR. LAWSON: Do we have any further questions? If not, thank you very much. (Applause)

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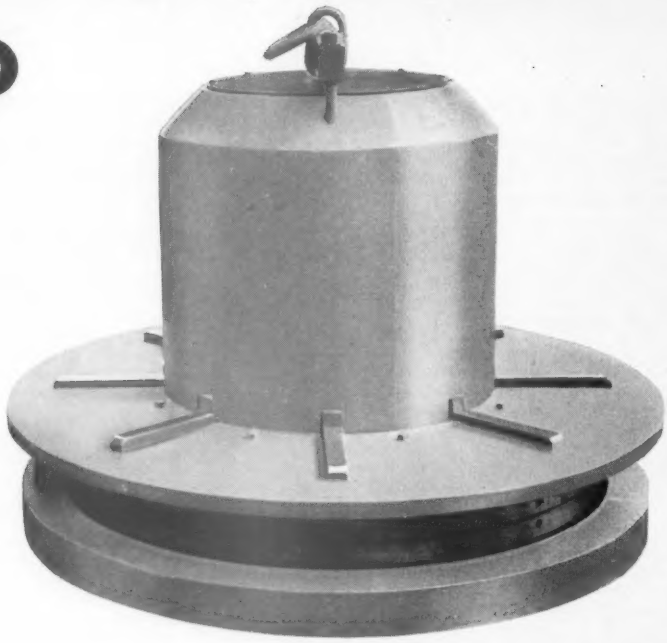
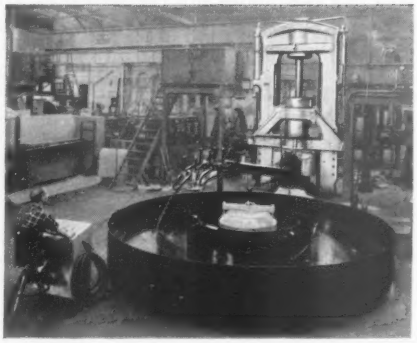


Model TWK (T) Combination Take-Up and Pay-Off

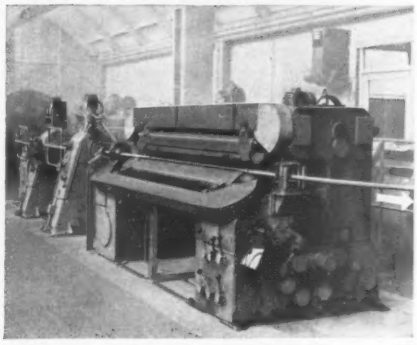
Portable design with infinitely variable speed, adapted for remote control.
Available with rapid-stop brake.



Combination take-up and pay-off used to feed a lead and aluminium cable sheathing extruder

Model TWK (S) Stationary take-up

Model BWK (S) Steel rope coiler



Combination take-up and pay-off used as take-up behind a stranding machine with caterpuller

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PAPER: "Small Diameter Power and Control Cables" — by Maurice M. Gilbert, E. I. du Pont de Nemours & Co., Wilmington, Del. The paper was presented by A. L. Gibson of the Polychemicals Department.

MR. A. L. GIBSON: Thank you, Mr. Lawson. In view of Maurice Gilbert not being able to be here today, and he deeply regrets this fact, I would like to explain very briefly his position with the du Pont Company.

Mr. Gilbert is Senior Electrical Engineer with our du Pont Engineering Department, and he is responsible for all the wire and cable installations in three of our departments, in other words, all the plants and all the construction which takes place within these three departments, they being Pigments, Poly-chemicals, and Grasselli.

Sometime ago, very happily, Mr. Gilbert became sold, at the expense of a great deal of blood, sweat and tears on our part, on Alathon, polyethylene and Zytel resin for wire and cable, and while he was a difficult man to sell, in that he wanted everything spelled out very specifically, he has become a staunch supporter of these thermoplastic materials, and consequently, a valuable man so far as polychemicals are concerned.

His installations which are represented in hundreds of thousands of feet, represent excellent case histories for us in the wire and cable group who are responsible for the development and the promotion of these particular resins.

This paper is intended to present some of the problems involved in providing safe, reliable and, at the same time, economical small diameter power and control wiring in today's automated plants.

The paper does not intend to propose that the solution arrived at here is the only one. It has, however, worked very successfully in papers presented for your consideration.

(Mr. Gibson presented Mr. Gilbert's paper)

MR. LAWSON: Thank you very much, and you can ask Mr. Gibson any questions that you may have on this new construction.

MEMBER: I have two questions. The first is, did you consider the use of this PVC insulated and nylon, this conductor in the control cable which you originally spoke about?

MR. GIBSON: We are considering that right at the present moment. When we first designed these cables we had two things in mind. The first and foremost was to use as many of our own materials as possible, but to be very fair about it, there are certain areas, particularly in other outside industrial plants where people operating the industrial plants are going to be very wary of the flame retardency part of this business and, therefore, we are designing at the present time and will use within our own plants a design based on the PVC insulated Zytel Nylon jacketed control cables. Does that cover it?

MEMBER: The second question was to ask you to clarify your remark on the order of magnitude of difference of the cut-through strength of the 2/64 or 3/64 construction as opposed to the 1/64 PVC with a Nylon. You spoke of something of the order of 100 times the cut-through resistance.

MR. GIBSON: May we have the last slide back again, please? (Slide) I think I know what you mean. I may have thrown you a curved ball in there. This particular slide does not depict the 100 times which is mentioned in the paper. Actually, the order of magnitude, if we look at the left-hand scale, just taking, for instance, load on the mandrel as a measurement, you will see we have 20 as versus perhaps 65.

MEMBER: At ten seconds?

MR. GIBSON: That is right if you want to take any one of these times — let's take ten seconds so that would be in the order of three to four times on deformation cut-through.

The test that Mr. Gilbert mentions is not the same test as this particular one. This is a higher temperature and, consequently, the spread is not as much as it was in his particular test.

MEMBER: Have you considered a Rulan composition for this type cable?

MR. GIBSON: Yes, we have. However, we are coming out with a new Rulan composition very shortly and until that time we are going to hold in abeyance any design work on that. As you know, there have been certain resultant physical properties coming from the additives in Rulan that we feel can be greatly improved by changing the composition. We will be doing that very shortly and possibly designing around the Rulan.

MEMBER: In other words, this replaces Nylon composition.

MEMBER: In view of the fact you went to a 1/64 thickness to the description above, have you considered a semi-rigid PVC?

MR. GIBSON: We have been perfectly willing to consider anything — for instance, that you, as a material supplier, would feel would be of interest in this development. Right at the present time, incidentally, the construction based on 105 degree resin is at the Underwriters Laboratories for THW approval. The wheels of the Underwriters Laboratories grind rather slowly, as you undoubtedly have found.

MEMBER: What kind of conductor? Was that solid or both, or what was it coated with?

MR. GIBSON: With the combination PVC. So far, the largest one that we have coated has been 300 MCM, so let me say this, they always say look at that beautiful foot of wire. And someone says, where are the other 999 feet. Most experience in, let's say, thousands of feet has been up to size two. This 350 MCM I mentioned to you was purely an experimental run we made, and it looked all right.

MEMBER: One little thing you omitted. What was the relative cost of this of 3/64?

MR. GIBSON: I am delighted you asked that. Unless somebody asked me, and the guy I hired to ask me didn't show up, I was asked not to comment. (Laughter) Actually, we anticipated a rather touchy situation here because we felt with the two operations, the separate extrusions, and all the attendant charges, in spite of the fact we were cutting down the PVC wall, we figured there would be a rather substantial premium attached to this. Now we find this, and I don't know all the details on it yet: We figured that the best way to get a feel for the price of this thing was to turn it over to a wire and cable manufacturer; and secondly, from the cable manufacturer to a distributor. Now for expediency of delivery to our many plants of this wire, which is now in process, there is a manufacturer, and a distributor.

Now the final key to the price situation rests with what the distributor charges the guy that is going to use it? And we were pleasantly surprised at the very low premium. When I say premium, I mean the very low difference in price on this wire to the TW of a similar category.

All I can do at this point is tell you unofficially, of course, that that range has been somewhere between five and ten per cent, but nearer to five per cent, which I don't think is a lot, because where the money is saved with this wire — I wish I had brought this graph with me — is not in the cost savings, but in ease of installation. In other words, if you and I are customers buying this wire for installation, the final tab is not what we pay the wire and cable manufacturer for the wire, but what is the final cost as we look at it in the finished end use position. There is a lot to be saved in labor and cost of installation.

MEMBER: Can't you rate this for TW 60, 80, 90, 105?

MR. GIBSON: Well, yes. We are going forward, as I say, with THW 75 degrees, but we couldn't automatically, because this is a lower wall thickness in the smaller sizes than the lowest you have in the TW now, which is 1/32 or 2/64. That is the only thing that is prohibitive.

Frankly, this thing on the building market particularly which we had hoped very seriously to hold in the experimental stage and go along smoothly in our evaluation, is in the field. It has pleasantly snowballed on us. The word has spread out all over the place about this wire and we are getting all sorts of inquiries on it and all sorts of requests for samples both from the wire and cable people and users who want to take a shot at it and use it in their plants. It is actually getting a little bit ahead of us now, and we just hope we don't lose our original ideas on this thing because of the enthusiasm for it so far.

PAPER: "An Improved Method of Vinyl Insulation Compounds in a Modified Testing Oven" — by Dr. Marcus Royen and presented by Allen E. Polson, Apex Tire & Rubber Co., Pawtucket, R. I.

MR. POLSON: Before I begin, I have to give certain recognitions here. First to our Company for the work that led to this particular point; to Dr. Marcus Royen, our Research Director under whose guidance it progressed to its conclusions. Secondly, I would like to thank the officers of the Association for the privilege of presenting this paper even though it had been previously presented in part early in June before the ASTM national meeting.

(Mr. Polson presented his paper.)

MR. LAWSON: Thank you very much, Mr. Polson. I am sure there are some questions. I understand that Dr. Royen is here with Mr. Polson today and he will be glad to help answer questions and talk with you after this meeting.

MEMBER: In your work with this oven, one of the big advantages is the ability to test different specimens at the same time without contamination. However, most air ovens that I am aware of recirculate a good part of the air through the blower again. Did you make any tests to examine whether this was a significant factor when testing different types of compounds in your tubes at the same time?

MR. POLSON: No, we didn't. We made some graphite tests. We have more or less concluded that this cannot be too important. If you figure hom much plasticizer, let's say, is lost in terms of absolute weight, and then you think in terms of how much air

goes around and through this and out, and then you get your pencil out and run some calculations, you will eventually find that the amount that might cross-contaminate is really insignificant. You get a row of zeroes and a couple of numbers, so we didn't bother to test it. We changed our minds.

MEMBER: Your calibration showed you using the velometer as you have it set up. I assume this is done with the door of the oven open.

MR. POLSON: Yes.

MEMBER: Since the open door affects your stream of air flowing through the oven, was this factor investigated as to whether the pattern changes since you operate under conditions when the door is closed and part of that air is flowing on the outside of the tubes?

MR. POLSON: To begin with, the open door affects the stream of air flowing through the oven but not through the tubes because when you make your calibration all of the tubes are in, as in this case here. Now it may reduce the overall rate of air flow through the oven which will then get picked up again when the oven is closed, but we believe — and did not check — that the pickup is going to be uniform in all tubes, so if we can adjust the tubes for uniformity among themselves with the door open, when we close the door we apply the same condition to everything, and hence everything goes up by the same degree.

MEMBER: Your tests have shown that the relative velocity through the tube definitely affects the amount of degradation or the amount of plasticizer lost to a fixed degree. In other words, each velocity is reproducible, though I realize it does not simulate test conditions.

MEMBER: How about closing the door completely to make it simulate the conditions and have no air flow through the tubes? Can you still get reproducible relative results?

MR. POLSON: I don't know. I haven't been in this for that long, but actually, didn't the industry first work with static ovens? Wasn't a forced draft oven a development that came later and, therefore, wasn't it considered necessary because of some failure of the static oven?

MEMBER: A static oven will vary considerably more from bottom to top. The air flow helps to smooth it out as your tests point out. It is the velocity of the air that is an extremely important factor in getting a rapid test. The elongation loss will increase with air flow, which is the most marked effect you show. Therefore, that is why the — two reasons why the industry went to forced draft ovens.

MR. POLSON: There is your answer better than I might have done it.

MEMBER: A compound which is accepted and known to be good, is it still good under your test?

MR. POLSON: Yes, of course. It is an arbitrary specification, isn't it? I mean we can set this thing up so that a compound which will pass the standard 70 per cent requirement, or whatever it is, will test 60 per cent. Then you would say the compound is no good. We can set the conditions so it will always come up 80 per cent and we will say it is terrific. You are speaking of an arbitrary specification number. I can visualize how an oven like this, if adopted as a standard requirement, may require a change in the number that is acceptable. Whether it is good or not I think is a question. This is arbitrary.

MEMBER: What is the cost of a unit like this to change over the oven?

MR. POLSON: The cost now, because they are hand-made, is $300 for a unit like this. The eventual cost should be a lot less.

MEMBER: That includes tubes?

MR. POLSON: Everything except the velometer, which is purchased separately.

MEMBER: Did one of your slides show the position of the sample tube as critical?

MR. POLSON: Yes, it did.

MEMBER: Why is that?

MR. POLSON: We have various theories. Theories can get you into trouble. Maybe some day we will be able to answer it. We did some tests that indicate it is turbulent. You can't have flow under these conditions. There is a swirl sort of pattern in the beginning.

MEMBER: Then I guess two different shapes of samples, two different shapes of wire of the same compound are perhaps going to show a different significance because of their effect on air flow?

MR. POLSON: Possibly.

MEMBER: With the finer size of tube?

MR. POLSON: We plan further work. We would like to double the amount of samples. I have friends in the business who say it is no good because it won't hold enough samples, so we recognize this, and it may be that as you look at this you can see we have a flap valve. If we have an iris valve as in a camera or some sort of thing like that, it might give us a better path through.

Not all problems are solved. Right now, all I can say is that if you lay your samples in the center of the tube you can get reproducibility.

MEMBER: I would like to add to your answer. I did some work with this type of oven several years ago. We had the same problem, namely, when you put the tubes in you do not eliminate the differences in flow particularly toward the right or inlet side of the oven, and I still feel quite strongly that even if you were forced to specify in your final method that the central eight inches of the tube be used, you still have made a terrific advance in uniformity and reproducibility over what you had.

Actually, what the manufacturers do today with present ovens is to place samples in about the same position and run a control at all times, but they try to make allowance for this defect by knowing where they place their sample. I am sure any conscientious sampler knows he gets different results if his samples are down at the bottom or at the top. I don't think the iris type of flap will completely eliminate it.

MR. POLSON: There are a lot of items that occur to me.

MEMBER: The one advantage which you have now, which is important, is that it is a basic, simple and effective unit. You can make it a lot fancier without improving the precision very much. This should be kept in mind.

MEMBER: It wasn't too obvious from your photographs on the placement of the dumbbells within the tube. Do you have some sort of holder to keep the dumbbells separated from each other?

MR. POLSON: Yes, come up later and look.

MEMBER: Were you able to make any comparison in reliability of this tube oven as against a wheel rotating setup in a conventional oven?

MR. POLSON: No direct comparison has been made. We have studied or looked at the round robin test by this task force. I don't like to speak for them because I can't recall precisely their final conclusion, but it is essentially that there may be reproducibility within an oven but not between ovens, but there has not been direct comparison. I believe that when the program that is to come gets outlined, I am quite sure that some people will take the same compound that is being tube-tested and merry-go-round test it and then there will be comparison. Thank you. (Applause)

FERROUS DIVISION DISCUSSIONS
9:00 A.M., OCTOBER 13, 1959

MODERATOR

Stewart S. Gray, Asst. Vice Pres.,
Union Wire Rope Corp.,
Kansas City, Mo.

PAPER: "A New Method for Fatigue Tests on Steel Wires and Wire Ropes and the Viewpoints Opened by the Results Obtained" — by Denis van de Moortel, Technical Chief Manager, United Rope Works, Leiden, Holland. Mr. Thomas Melville presented the paper for the author.

The first Ferrous Division Technical Session of the Annual Convention of The Wire Association was called to order at nine-ten o'clock in the Grand Ballroom of the Statler Hilton Hotel, Cleveland, Ohio, Mr. Stewart S. Gray, Assistant Vice President, Union Wire Rope Corporation, Kansas City, Missouri, Moderator, presiding.

MODERATOR GRAY: I would like to welcome you gentlemen to — I suppose this is Tuesday morning — the Ferrous Session, you gentlemen and unemployed steel workers. There are a couple of employed ones here, but there are not very many. I don't know how they got time off to come here.

Our first paper this morning is "A New Method for Fatigue Tests on Steel Wires and Wire Ropes and the Viewpoints Opened by the Results Obtained." This paper is by Denis van de Moortel, and will be read this morning by Tom Melville. Tom, won't you come forward and make your presentation?

(Mr. Thomas Melville presented the paper prepared by MR. VAN DE MOORTEL.) (Applause)

MR. GRAY: Thanks very much. I presume that both you and Mr. Brown are available for questions.

MR. MELVILLE: We can try.

MR. GRAY: From my own observation and having read the paper previously, he has made this statement in his paper which to me was quite interesting, and I looked hopefully for an answer. He said as follows: "While utilizing this fatigue testing machine during the last couple of years we were

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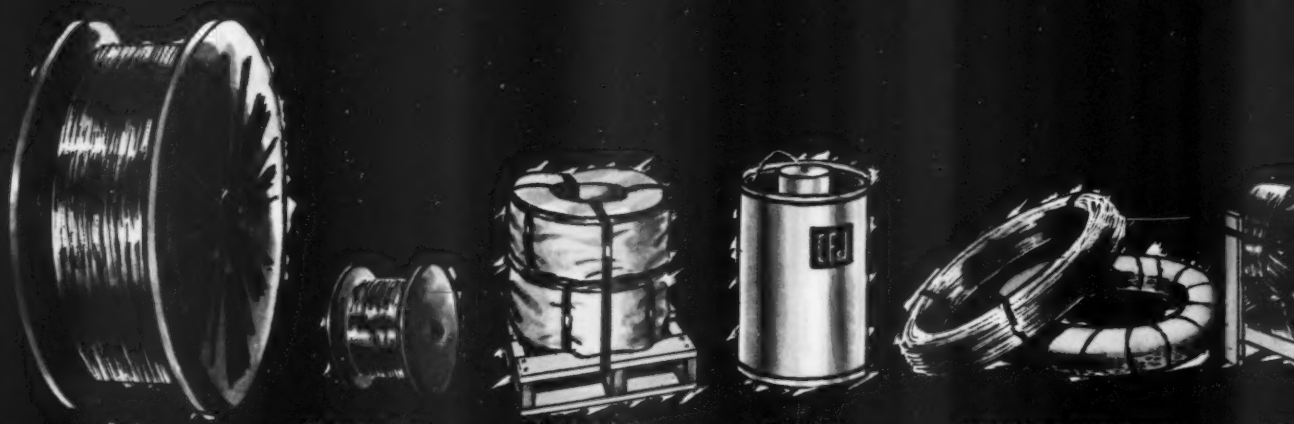

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able (a) in cooperation with the steel producer to develop a superior grade of steel wire especially for use in the important mine shaft ropes."

You have no information as to this superior grade of steel, I presume?

MR. MELVILLE: That is right. I can say this: I imagine what he came up with there is that with the fatigue test we can determine the effect on the wire and how the fatigue is in the ropes. For instance, we are working strongly with the effects of decarb when there is a lot there, that feeds right into the rope and gives poor rope life. I am wondering if he doesn't mean something like that, that he has done tests on the machine and been able to tell that in such-and-such a practice one wire is better than another, but I don't know what quality of wire he is talking about.

MR. GRAY: Is there anyone in the audience who has any questions at all? We can at least try to get an answer from our own experience or from this paper.

MR. BROWN: I can make one comment on the paper; that is, that our rope experience does not confirm all the conclusions that he has drawn in his paper.

MR. GRAY: That has been basically our rope experience.

MR. BROWN: We know nothing about that machine, how it performs. We have very little data in the paper in regard to the time or the rope and the testing load used. There are a lot of things about the grouping of the tests, the ropes that are used there, that could influence the results we have got, and the construction of the ropes, how they are made, how they are put together. Were they all his own ropes, or were they ropes brought in from the general field?

There is so much information that we don't have that it makes it rather difficult to make comments that are worth while on those conclusions, because his conclusions are on his ropes. They are European ropes, and there is a lot of difference between European ropes and American ropes. We today do not feel that we take a back seat to any European rope.

MEMBER: Were the ropes preformed?

MR. BROWN: I don't know.

MR. GRAY: I don't recall he mentioned that at all.

MR. BROWN: There is not enough information in that paper.

MR. MELVILLE: He doesn't go at it in a very detailed way.

MEMBER: Does he say in the paper how that machine operates, how many revolutions?

MR. MELVILLE: No. I don't remember. My own feeling would be that it is very slow.

MR. GRAY: With that walking beam in there, the speed would definitely be restricted.

MR. MELVILLE: I would guess it is 120 minutes, a Warner type of approach, with reverse.

MR. GRAY: Any other questions or observations? No commercial people?

PAPER: "Air Force Tow Members" — by Jack E. Tiede, Supervisory Eng., Air Force Proving Center, Elgin Air Force Base, Florida.

MR. GRAY: Thank you very much, Mr. Tiede. Now we know where some of our money has been going. Do any of you gentlemen have any questions?

MR. TIEDE: That is the advantage of having a subject like this — you hit them cold. They don't have much to say.

MEMBER: I have one. I know Jack well enough to ask this. In the experience you have with fatigue failures, what is the ratio between those that might be going over the sheaves, running in and out the gear there, and those that might occur out at the stand at the other end, vibration and so on?

MR. TIEDE: We don't have too much information on vibration. We attribute most of our failures to loading above and beyond the yield point, and right now we are trying to correlate elongation of our tow members with life, so we can discard our tow members prior to failure. All of these tow members, whether you are talking about wire or strand or cable, the cost of them is relatively small as opposed to the cost of having two or three or four aircraft become airborne. If you lose the target then and you have to cancel the mission, you could have bought a lot of tow members for the price of that cancellation, and that is why we want to get something that we can predict the life of, have a high reliability, in order to reduce our training cost in this alone.

MEMBER: Can you explain the step and strand tow members, and also wouldn't a strand cause too much drag?

MR. TIEDE: Let me answer your question on the strand, first. You notice that I mentioned all of these strands were swedged. There has been very little — we have had some — drag on the strand versus wire. At the same time the difference in the drag is very little, small enough to be negligible. We feel if we can get an increase in reliability it is worth it.

When you talk about the step configuration, it is what we have done on the strand. The Navy has done a lot more work on this area than we have. You take two members there. You notice there I mentioned 1/16. This is about .063 and .081. What we have done is merely taken and cut the core out of the larger member, and this is all we have to do, cut it out, and you have approximately the same string in the outer jacket of the larger cable that you do in the entire diameter of the smaller, and you just relay it. Of course, it is a little bit larger in diameter, but then you have to secure the ends with a small fitting and it works quite safely.

Tapering is just what it implies. It was on the basis of a constant taper. As you can see from the cable profile over here, this would not be the proper approach, that you would have to go to computer and integrate that entire length and you would not have a constant taper, but on this one that we are talking about, on the light-weight target this taper would amount to approximately one mil per 1,000 feet.

The only way you can get that on the wire is by chemical milling, I presume at the present time, and of course you saw, if you read the paper, that there are some assumptions we had to make of constant tensile, and we had to select a tensile. All we want is more tensile.

MR. GRAY: Everybody wants tensile. Any other questions? Thank you, Mr. Tiede.

PAPER: "High Temperature Tests of Aircraft Control Cable" — by Howard J. Godfrey, Asst. Chief Devel. Eng., John A. Roebling's Sons Corp., Trenton, N. J.

MR. GRAY: Thank you very much, Mr. Godfrey. Has anyone thought of a real good question for Mr. Godfrey? There is a wealth of material there.

MEMBER: I would like to ask if he has any explanation for that Stainless 304 which dropped down — it really dropped down, didn't it — to 260. You also show an increase of 800. Do you tend to show stainless jumping up?

MR. GODFREY: I don't know that I have a reason for it, but I think it is a brightening effect, the strain agents and precipitation hardening or whatever is going on in the metal.

To try to find out what happened, we took some wire, just plain wire, and gave it the same heat treatment, and we didn't get the same results. We got no drop in strength. We got a gradual increase in tensile strength to 800 degrees, which indicated to us the inner strain you get in stressing cable, with stress concentration, which causes the lowering of strength due to some brittlement taking place in the wire. How general that is, I don't want to say right now, but that is true of all Type 306 stainless. It was true of a lot of stainless, and as far as we know it is representative material, but until further work is done I wouldn't want to have anybody say all steel stainless is liable to do that. It might have something to do with carbon content or something else abnormal to that particular case, but that was the result and it was apparent it was a brittlement effect which had the effect on the cable, but it did not affect the single wire.

MEMBER: Did you test that wire before you stranded it or take the wire out and strand it?

MR. GODFREY: Actually, the wire test was not made on that particular lot of wire, so it still wasn't conclusive. We got the cable finished, as manufactured, and we did not have any of that particular wire that went into that cable. We made some tests on wires taken out of the cable, but we didn't find anything wrong with that, but apparently it is the brittlement of the material.

MEMBER: You almost answered my question in the last statement. Could you explain the change in the individual tension record, all in terms of the number of wires that were broken?

MR. GODFREY: No, I have never been able to do that, in spite of the Holland paper this morning. Maybe I shouldn't say too much about the breaks in wire ropes by measuring the number of broken wires. We didn't really make too much of a study of that, and didn't try to correlate the number of broken wires with the remaining strands. In some cases there are just too many to count. You can never count the wires on the inside anyway, so I would say we just didn't try to do that.

MEMBER: Was there a drop in the tensile strength in many instances because of the fact they had broken wires?

MR. GODFREY: We had quite a few broken wires in the cable and could not see much loss in strength. Sometimes it is quite surprising to see a cable with a lot of broken wires and make a test on it, and the strength is up pretty well.

MEMBER: I was wondering, when you show the increase in tensile strength, did you check any other properties of the wire that might have occurred in the wires?

MR. GODFREY: No, we did not check any of the other physical properties of the wire after the heat treatment. These were tested at room temperature. No, we didn't study

the wires for ductility or torsion test or anything like that.

MEMBER: Did you make a study of the temperature of those?

MR. GODFREY: Room temperature test on the carbon steel? Yes, in fact, on all these high-temperature tests we made the high-temperature test and there was also another test at room temperature on the lower pulley. And on the 1/16 shear with 10 per cent load, you get very little loss in strength due to fatigue under those conditions.

MEMBER: Well, this was just the temperature down in it, or just that one temperature? Do you heat the strand up to the temperature and then cool it down to room temperature?

MR. GODFREY: We did it in both cases. We tested the cables as manufactured, and after heat treatment, and with heat treatment we would say it is 1000 degrees and let them cool down and put them on the machine, and while they are on the testing machine one-half of the sample would be tested at high temperature and the other at room temperature.

MEMBER: Do you find any difference in the fatigue of the wire temperature after heat treatment?

MR. GODFREY: No particular benefit after heat treatment.

MEMBER: Was it any worse?

MR. GODFREY: Well, the only one we really investigated fully was the Type 304, and that was definitely beneficial, but on the other cables there was no particular improvement in the fatigue properties at high temperature after heat treatment, and at room temperature. After heat treatment I would say they are better because the heat treatment increased the strength so you had a higher breaking strength.

MEMBER: I was wondering, say, about 500 degrees, after you get it up to 500 degrees and then run it at room temperature, what is the difference between the 400 degrees and the 800 degrees or 1000 in that fatigue?

MR. GODFREY: We didn't run any high temperature fatigues below 800. We either ran them at room temperature or 800 degrees and above. Our problem was to find something that would operate at 800 degrees or above. We were not interested in anything in between because that wasn't the problem. If we couldn't find something at 800, we didn't have anything, so we wanted to concentrate on 800 to 1000, about as high as we could go.

MEMBER: Have you found that in the the past, over a period of time, you have done lots of tests for stainless steel which show a lower efficiency than others, and by lower efficiency I mean in relation to actual strength, do you think that possibly what you have found at the lower temperature, up to 260 degrees is due to the stranding and closing that something might take place that brings it down, some more than others, and isn't that covered by heat-treating, as you have indicated?

MR. GODFREY: We haven't done enough work. We have actually tested two batches of 304 stainless steel, two lots from two different pieces of steel. We found that same thing occurred in those two lots.

It may be tied in with the chemical analysis of the 304 stainless. I know there are a lot of differences as far as the standard room temperature fatigue test goes in stainless steel, but if you keep your carbon content down below the specification you are usually all right. That is why they put it there, 480 carbon, the maximum allowable Type 304. You get too much carbon and get precipitation and brittlement, and it affects the strength.

MEMBER: For your 177 PH and 286 Inconel, was it fully aged before you began your work?

MR. GODFREY: No, as far as we know. We purchased these wires. They were in the cold drawn condition, as drawn, and we did all the heat treatment on the material, so as far as we know there was no aging heat treatment on the wire before we made it up into a cord.

MEMBER: You are not aware then of whether, for instance, the 286 was heat-treated and then aged prior to making the test?

MR. GODFREY: That may have been done before drawing, but as far as we know, as we got the wire in the cold drawn condition, there was no aging on it at all. It was just cold-worked from some heat treatment. Whatever that was, I don't know.

MEMBER: What was the p.s.i.?

MR. GODFREY: The p.s.i.? I don't have all the figures on the wire, but the 177, tested on completed cord, after heat treating one hour at 900 degrees, the p.s.i. was around 270,000. It was pretty high strength for stainless.

The heat treatment, as I said during the paper, increased the strength 30 per cent on the 177. The 177 PH showed the greatest increase in strength due to the heat treatment. That is what they put the aluminum in there for, to give it that high strength.

MR. GRAY: Thank you very much, Mr. Godfrey, for your informative paper. (Applause)

PAPER: "The Rolling of Round Wire into Flats and Rectangles" — by Alexander F. Sperduti, Asst. Chief Eng., The Fenn Manufacturing Co., Newington, Conn.

MR. GRAY: Thank you, Mr. Sperduti. Are there any questions?

MEMBER: In the early part of your talk you mentioned annealing and reviewed the effects of cold working in heavier products. Did you infer that would take place in time?

MR. SPERDUTI: As of this date, there are people who are attempting it.

MEMBER: You mentioned that the finish of the bar depended partly on the surface condition of the mold. How about the condition of the coating or anything like that?

MR. SPERDUTI: Of course, that has an effect.

MEMBER: A very large effect or primarily?

MR. SPERDUTI: By using wire that has been drawn or should be clean, getting the finish on the wire. The wire should be entirely clean. If you have scale on it, the scale will roll right into the wire. We start with a good finish.

MEMBER: What type of bearing do you use?

MR. SPERDUTI: We use roller bearings. At the same time, we have a special mounting on the end of the roll which takes up any actual thrust, but the main bearing is a roller bearing.

MEMBER: Where can we get copies of those two graphs you have there, the formula and the curve you have there?

MR. GRAY: We are publishing this article in the magazine and there are copies outside right now.

MEMBER: Do you use full A.W.G. numbers in your wire, or do you use actual?

MR. SPERDUTI: To get a designated finished size, you should have an accurate starting round to begin with, but there are several things you can do. You can start off with standard wire gage size that is slightly over size from any wire you collect by the charts, and there are things you can do. You can arrange where you can have more linear reduction and get more elongation in length, thereby using a larger wire you can get more on the end, tension, rolling mill, using coolants at the first stand. You can put a little Turks Head in front of the first stand which takes quite a reduction there. So you can start.

MEMBER: What do you consider to be the maximum economic speed in rolling steel wire in the tandem mill?

MR. SPERDUTI: Well, I would say a speed of rolling up to a point of 2400 feet a minute. Generally, most wire mills are in the range of 1000.

MEMBER: No mention was made of the camber. Is that equipment cambered?

MR. SPERDUTI: Camber is generally a matter of guiding. If you have the proper guidance on the wire coming out of your rolls onto your wheels you should be able to make camber. In very small sections it is no longer possible to do sometimes, but by putting a straightener on the edger side of the rolling mill before you put on the reel it takes care of it.

MEMBER: What camber would you expect in the wiring, eight or ten feet?

MR. SPERDUTI: Eight or ten feet? Well, I would say as much as a quarter of an inch, keep it down.

MEMBER: You talk about rolling 2400 feet per minute.

MR. SPERDUTI: It would have to be a spool. You couldn't use a bundle and try to pick off. You have to have material transverse run on a spool.

MEMBER: About 1500 to 2000, the same thing?

MR. SPERDUTI: Bundles are all right up to 600 or 700 feet a minute.

MEMBER: In the rolling of unsymmetrical shapes, do you hold the wire in it as by entrance as well as by the discharge side?

MR. SPERDUTIS Generally the wire will find its own way into the roll. If you put too much pressure on it, it will be one way or the other, but the guides need not be perfect. Just keep them in the general vicinity. It will follow through pretty well.

MEMBER: The larger size rod?

MR. SPERDUTI: We have made an installation where they are finishing 5/8 by 1¼. That takes it starting around something like 1.5

MR. GRAY: Any other questions? Thank you, Mr. Sperduiti. (Applause)

2:00 P.M., OCTOBER 13, 1959

MODERATOR

Rudolf H. Hertzog, Met. Eng.,
Wire Mills Div.,
John A. Roebling's Sons Corp.,
Trenton, N. J.

PAPER: "ABC of Better Lubrication and Cooling in Steel Wire Drawing" — by J. G. Wistreich, Head, Mechanical Working Div., British Iron & Steel Research Assn., Sheffield, England.

MR. HERTZOG: Thank you very much, Mr. Wistreich, for a most excellent presentation. We are now open for questions from the floor.

I have one to start. Since we are rapidly reaching limitations in speed of wire coiling due to the inadequacies of cooling, I would like to get Mr. Wistreich's thoughts on going back to the wet wire drawing for heavier sizes — that is, drawing in a lubricated solution. I would like to have his thoughts on that.

MR. WISTREICH: That is a very interesting and important question. I could sum it up as follows: When the right lubricant is found, that is the ideal solution. So far, I haven't seen any signs of a lubricant being found which would enable one to draw heavy size wire with resultant reductions such as you have been doing with dry wire, that we could consider the right way, the economic way, with a machine that may have Type 12 holes instead of 6 or 7, and weigh the gains in terms of better cooling against the losses in terms of sizes of machine.

But I think this is what we would like the lubricant chemists to concentrate on. If they can solve the problem, that is the way it would be efficient.

MR. HERTZOG: You lubricant manufacturers certainly have a challenge here to come up with a lubricant that will allow you to draw wet, 6 or 7 holes.

MEMBER: Some time ago I saw a reference to the use of fluidized solids in cooling wires. Is this work progressing any further, and has it been used practically in wire-drawing plants?

MR. WISTREICH: I don't know what reference you have in mind, but I think there is dry work, and it is still progressing. It is too early to say much about it, except that the soap for it is being sheared now as for very heavy wire. I don't know of any plant in which it is being used.

MEMBER: How much did you increase your total consumption of soap in the pressure dies in question?

MR. WISTREICH: I don't have any figures offhand. You increase your soap consumption at first very substantially, but we haven't worried about the soap consumption because we think that the cost of the extra soap is negligible compared with the gains. You do away with some of the expensive coatings one is forced to use when one uses conventional means, as it were.

MEMBER: Would you say that the soap distribution was uniform around the entire circumference of the ingoing wire on your pressure dies?

MR. WISTREICH: If you think in terms of wire, definitely, yes. Now, if you start with rod, then it depends on the design of the pressure unit. We have played around a lot with these pressure units and we have achieved results, among other things, such that the wire that came out of the first hole still had the same bad shape as the rod. It is not that we weren't interested in that, but it shows you what you can do with these special dies. What we then did was adjust the opening of the unit to give uniform distribution.

PAPER: "The Drawing and Handling of Long Production Run Wire Coils" — by Uno V. Johnson, Supt., Rod and Wire Div., Detroit Steel Corp., Portsmouth, Ohio.

MR. HERTZOG: Thank you, Uno. I am quite certain the production of these heavy type coils is a definite step forward. Do we have any questions from the floor?

MEMBER: How do you handle any defects he might run into in the long production run coil?

MR. JOHNSON: The bundle size is inspected in the same manner we would inspect a 300-pound bundle. In fact, when these big bundles go into our testing department we have no band wire. In other words, it is measuring about 50 inches. I am talking about a 3000 pound bundle now. Therefore you have the entire surface of your bundle visible to our inspection.

Does that answer your question? You were talking about surface imperfections.

MEMBER: Yes. If you run into a small surface defect in the middle of the coil, how do you test that out?

MR. JOHNSON: Are you talking about seams or slivers? There is rod inspection for seams. In other words, our inspection is made before the rod goes into the wire.

MEMBER: Where you are drawing 4000 pound bundles, have your drawing speeds been affected at all?

MR. JOHNSON: No, they have not affected our drawing speeds. In fact, our production has been increased due to the fact that we did not have to stop at the finishing block too many times to strip the bundles.

We are fortunate in having heavy motors in our drawing equipment, so it definitely has not reduced our drawing speeds.

MEMBER: What are your coils in the rods?

MR. JOHNSON: 320 pounds.

MEMBER: What do you do if you get a break?

MR. JOHNSON: We normally ship a few bundles, 10 per cent. If a customer specifies 3000 pound bundles, we will ship those bundles, and they do not object too much to it. They do not object to receiving an occasional smaller bundle.

MEMBER: You don't make a joint in the big bundle?

MR. JOHNSON: That is correct. We don't make a joint. We definitely do not, through all our drawing operation.

MEMBER: The dead block which you showed, was this a drawing block or winding block?

MR. JOHNSON: It is a stationary block which has a die revolving around the stationary block, and then it deposits the wire on a carrier reel.

MEMBER: Have you any maximum height that you can tie down to our size and block diameters as to how far you can push the wire up and still get an acceptable cast? Pushing the block?

MR. JOHNSON: You are not talking about the conventional block. We have found most of our wire that is thrown on a conventional block has been confined to about 3000 pounds. Because we have not had demands for pick-up bundles, we do ship 4000-pound bundles of low carbon wire in sizes 120 and 187 that have been growing on the stationary block.

MEMBER: On the 3000-pound bundle, about what do you get off the 30-inch block?

MR. JOHNSON: I think that was shown. It is around, I believe, 25 inches. I will get that exact measurement for you. I just don't remember offhand, but I can get that for you.

Now your carrier reel is about 22 inches. It is around 25 inches that we have inside the hammer.

MEMBER: Were you able to reduce your work force on your machines?

MR. JOHNSON: Yes. Every time you start in the 300-pound bundle we went to the 600-pound bundle and changed our intended rate. You can figure out 10 or 15 per cent on each double-up on your bundle weight.

MEMBER: You actually reduced your work force?

MR. JOHNSON: Yes.

MEMBER: How heavy a coil are you feeding to your packing?

MR. JOHKSON: A 320-pound bundle.

MEMBER: You don't go to the heavy coils for packing?

MR. JOHNSON: No. We do all our welding on wire butt-welding equipment.

MEMBER: Do you contemplate it?

MR. JOHNSON: We are looking at it, definitely.

MEMBER: What are you going to use for take-up?

MR. JOHNSON: Upside down, perhaps.

MEMBER: In your butt weld, are they marked on the radial?

MR. JOHNSON: No, they are not marked. We use most of our big bundles going in with the upholstery spring and other spring wire. We have done very little welding in connection with oil-tempered wire from England. This thing is still in its infancy and we are putting it in where we know it works, definitely, and in upholstery spring wire and any mechanical hard spring wire we have found it very, very satisfactory.

MEMBER: On your packages you said anywhere from 2000 to 4000. Do you change the width and thickness of your strapping on the coils there? I think you said ¾. Do you use the same on all of them?

MR. JOHNSON: Let me explain it this way: When we were hand-strapping 3000 and 4000 pound bundles, we were using 1-inch wire strapping. On the machine we now use ¾ x .004. That is used for the strapping of the big bundles, and for freeing 300 and 600 pound bundles we use ¾ x .035. So it is a little thicker, but still ¾ inch wrapping.

Incidentally, when we were hand-strapping we found it necessary to handle the bands on the bundles by hand, but now that we have the machine, we have eliminated that.

MR. HERTZOG: Thank you for a very interesting presentation. (Applause)

MR. JOHNSON: I might say the next film will give you the packaging procedure that we use in the new machine.

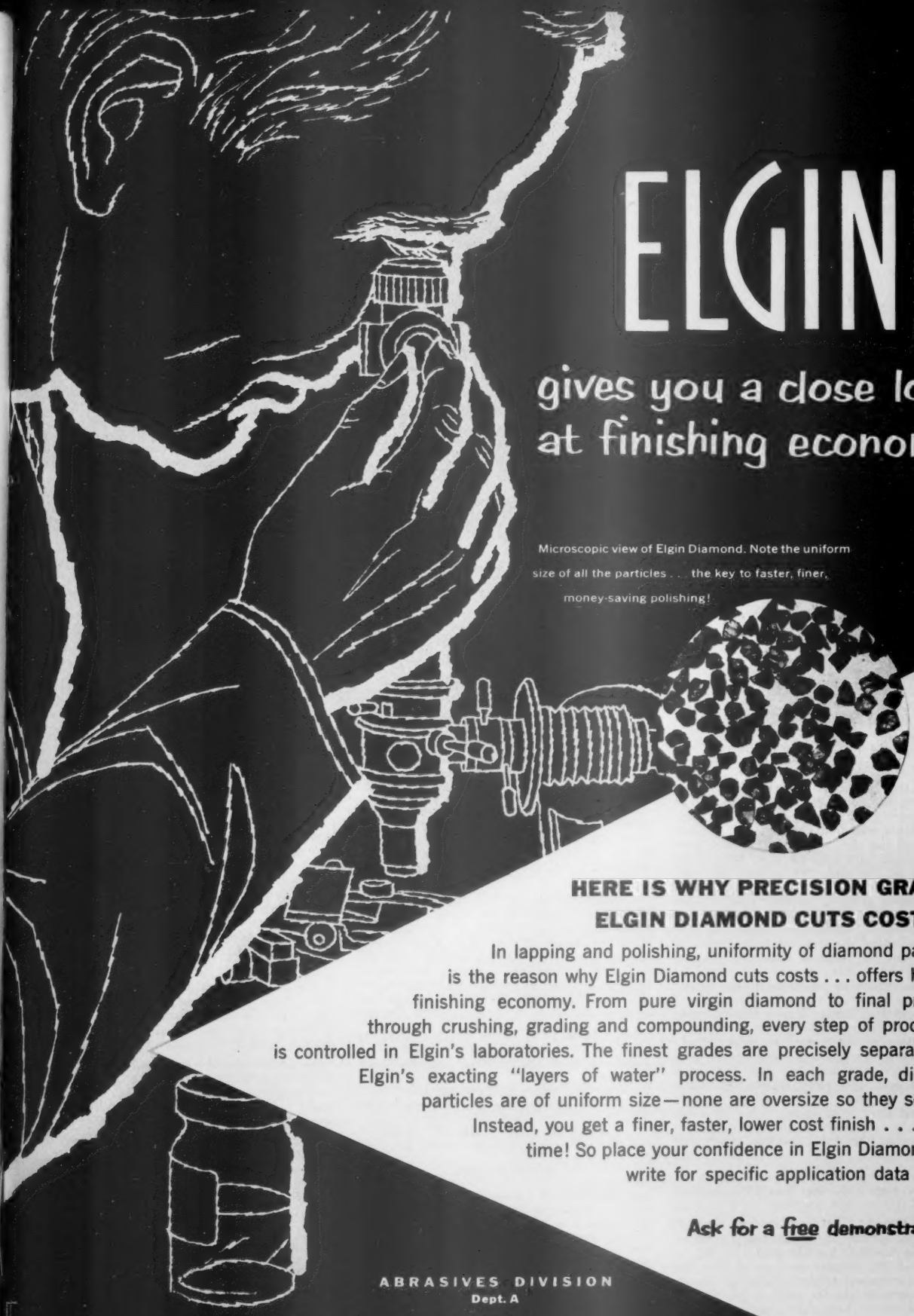
MR. HERTZOG: We have a happy coincidence this afternoon. If you make a big bundle somebody has to wrap it up, so we have a man here to wrap it up for us. Our next presentation will be given by Joseph F. Beckman, Vice President of the Signode Steel Strapping Company.

The title of his film is "The Packaging and Handling of Coiled Wire at Detroit Steel Corporation." Joe Beckman. (Applause)

(Mr. Beckman presented his film.) (Applause)

MR. HERTZOG: Are there any questions from the floor on this presentation?

MEMBER: In the picture there, those were only 3,200 pounds, large production coils,



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weren't they?

MR. JOHNSON: On the new machine, about 2,200 pound bundles. That is correct. The average weight was 2,240 pounds.

MR. HERTZOG: Are there further questions? Thank you Joe, for a very good presentation.

Our final presentation this afternoon will be a film on "The Use of Wire in the Cold and Hot Forging Industries." Cold forging really gives wiring a test for quality. I am sure you will find the presentation by Mr. Dale Walcutt, of the National Machinery Company, very interesting.

(Mr. Walcutt presented his film.) (Applause)

MR. HERTZOG: Now I know why the people who supply cold heading quality wire are unhappy once in a while. They sure murder your products, don't they?

I have one question to ask Mr. Walcutt. He mentioned lubricity built into the steel. Do lead steels provide any of that lubricity?

MR. WALCUTT: Yes, a lot of steels supply that lubricity to some extent, and so does sulphur. Unfortunately, however, they are conducive to surface cracks that develop in the final product, and so we avoid as much as possible the use of lead in cold forging of steel, lead in cold forging of brass, sulphur in cold forging of steel, unless it is absolutely necessary in the final machining stages.

MEMBER: What grade of steel was that on the spark plug?

MR. WALCUTT: SAE analysis determined about 1016. It did have a special phosphate coating. It had the aluminum killed fine-grain structures that we are looking for in the movement of metal to that extent.

MEMBER: On that 1¼ inch rod or 1½ inch rod, how did you break that in?

MR. WALCUTT: Unfortunately, that was not shown on the film because it was rather time-consuming as an operation in the film, but a device was built in such a way that we gripped the end of the coil, having been tightly wound into position from the coiling operation of the mill. We gripped the end of it in a jaw and V-shaped channel iron. Having been gripped in that position, we reversed the direction of the coil-holding device so it moves back, away from the gripping mechanism, and while being held in that position, the beam in which the channel iron is located has a drive or hydraulic mechanism that can be brought up underneath it to more or less break the back of that material in that shape. Having once straightened that much of it, we then put it into position in the frontal extruding mechanism, where we grabbed hold of the end of the blank, approximately two feet back from the end, and force it into the arbor of the die and grab it back, and get another length and push it in again, so we have approximately a 3-foot length drawn into a diameter into the wire drawing guide that follows.

MEMBER: What would you consider to be a good average die after you have finished the job?

MR. WALCUTT: That is a loaded question. Ball joints, because of the fact that the shank portion is tapered, provide problems for us because of the angular loading of that die and the tendency toward bursting. Consequently carbides are not used as liberally as we might like to have them because of their lack of desire to have yield. They won't take on account of the spreading action that they must take on such an operation, so we have to go to high-speed steels and heavily load them. We may have an interference of as much as .009 or .0010 on the diameter of that blank.

I still haven't answered your question, have I? I don't know whether I can, because that figure will range very much, depending on whether the blank is going to be forged to finished dimensions or whether it is going to have subsequent machining operations. In operations such as you saw here I would estimate they would get something in the neighborhood of 40,000 or 45,000 pieces out of that die before it was considered over-size. They hope they won't get to the place where it is broken before they wear it over size.

MEMBER: What improvement would you expect to find if you were to phosphate all over by tumbling instead of having a bare end cut off there?

MR. WALCUTT: We would expect to find some improvement, especially on blanks where we are doing internal or backward extrusion, but in gaining this improvement we lose the advantages of having a mechanism that will feed in and shear off the blank. We would then have to provide a means for doing that operation, because the difference in punch life with the coatings, or should I say fluids, that are now available versus this rather expensive coating and laborious method of having to do it the other way, it doesn't show enough savings. Our tests have nearly all been on the basis of starting the coil wire, shearing from the blank, shearing the blank from the wire, and proceeding on through. There is some advantage, but the advantage is a costly one.

(The next question could not be heard.)

MR. WALCUTT: If I understood your question, it had to do with whether or not decarburization of the material before drawing does something to the surface that enhances die life.

MEMBER: No. Does cracking occur in this heavy operation?

MR. WALCUTT: Yes. We had some very unhappy people about blanks in some plants. Those cracks don't create smiles on the faces of the operators or users. Many times they want to bounce that material right back at you.

It seems to be the best answer that has been found possibly in the elimination of the seams and surface cracks. We are not sure. Some of them might be surface cracks caused by a crack in the wire-drawing die or handling from one operation to another, but the cracks are there. They don't care how they got there. They want to get rid of them and keep from having them again.

MR. HERTZOG: I want to commend our speakers for their very fine presentations. You have been an attentive audience.

9:00 A.M., OCTOBER 14, 1959

MODERATOR

Carleton W. Garrett, Met. Eng.,
Graham Research Labs.,
Jones & Laughlin Steel Corp.,
Pittsburgh, Pa.

PAPER: "The Manufacture and Properties of Basic Oxygen Steel for Wire Products" — by H. B. Emerick, Dir. of Technical Services, and Sol Kreisberg, Metallurgical Supvr., Jones & Laughlin Steel Corp., Pittsburgh, Pa.

MR. GARRETT: Thank you. I told both Harold and Sol that we would probably have questions, and they felt perfectly confident they could answer all of them to your satisfaction.

MEMBER: Did you find that basic oxygen steel is more advantageous for wire than for other steel products?

MR. EMERICK: Sol may have a prejudiced viewpoint on that question, since his concern is exclusively with wire products.

I would say it is not necessarily more advantageous for wire than for other products. We produce more of this type of steel to certain other commodities than we do to wire commodities, and its good weldability is a definite advantage in high-speed continuous butt welding in tubular goods. Its low content of segregating elements, plus nitrogen, which affect the work-hardening characteristics of the steel, make it definitely advantageous for cold reduced flat-rolled products, notably tinplate.

So it has potential or demonstrated merit in many different fields, including wire.

MEMBER: Have you made any hot-rolled spring wire from the steel and any oil-tempered spring wire?

MR. KREISBERG: No, we have not. We make some rope wire. Several heats were used in the preliminary. As I said, we started out and got customers. So far we have not touched spring wire or oil-tempered wire.

MEMBER: In your high carbon sheet have you had enough experience to express an opinion on conversion because of chemistry? Second, do you have any success in recarburization when you are lower than what you aimed for in the final analysis?

MR. KREISBERG: We made a few heats. As far as conversion is concerned, they hit them on the nose pretty much. I have nothing in the paper on European practice. They are pretty enthusiastic. We haven't had enough experience to verify that in wire.

MR. EMERICK: I mentioned the high degree of chemical efficiency with which the oxygen is utilized in this process. Knowing the composition of your charge materials, notably the blast furnace metal, you can calculate the time period through which oxygen should be fed at a regulated rate to reach a predetermined carbon end point, and turning heats down according to those estimates has enabled us to make a very close approximation to the desired end point carbon in the manufacture of high carbon steel.

Sol mentioned that we had only produced a few high carbon wires, but we have produced high carbon specialty strip heads in larger numbers, and have been quite successful in controlling the end point at the desired level by metering the oxygen input.

As far as recarburizing is concerned, we made quite a bit of steel in the 30 to 40 carbon range, and some of these have been made catching the carbon, others have been recarburized with graphite petroleum coke, and either method can be used satisfactorily.

The reason we don't make more high carbon wire is there really isn't much incentive for us to do so. We have quite large outlets for this type of steel in low carbon grades, wires as well as flat parts and tubular goods, and I think it is in the low carbon grades where the real advantage will be found for steel with lower nitrogen content, lower sulphur content and so forth. There really isn't a lot of reason for us to push high carbon wire in this process with our present capacity for the present.

We have plenty of outlets in low carbon steel.

MEMBER: Is it possible to catch your carbon on the way down and save 70 carbons,

if you are starting with high phosphorus? Just looking at the curves, I am wondering if it is possible and still remove the phosphorus.

MR. EMERICK: What do you mean, starting with the phosphorus?

MEMBER: Starting with 3 or 4 per cent phosphorus, such as we are talking about in Europe.

MR. EMERICH: The highest iron I saw in Europe was about 2 per cent phosphorus. I don't think it would exceed 2 per cent anywhere in the world.

Here you manipulate that lance higher and the oxygen flow rate and the amount of fluorspar or roll scale which you use to fluidize the slag at an earlier stage during the heat, and in the case of 2 per cent phosphorus take off a preliminary slag which will be high in P_2O_5 content and finish the heat with an additional quantity of lime, varying material to get the phosphorus completely out.

This won't be necessary in any location in the United States, except possibly down in Birmingham and the vicinity where the phosphorus in the iron is approximately three-quarters of one per cent and that is the highest phosphorus iron found anywhere in this country.

Our iron is quite low in phosphorus at Aliquippa, under .15 per cent. So we have an ideal situation for the application of a process such as this.

MEMBER: How about the etching characteristic compared with open hearth steel, for instance, the low carbon galvanized wire?

MR. KREISBERG: I wish I could answer you. We have had some indications that basic oxygen steel ages the same as open hearth. I believe the oxygen level in the two steels is quite similar. Is that right?

MR. EMERICK: That is right.

MEMBER: On the rimming grade, is there any difference in the yield to the ingots between the two processes?

MR. EMERICK: Not significantly. In some applications where sulphur segregation is a problem the lower sulphur content of oxygen steel will enable you to crop somewhat less than from the top of the ingot. But I would not say it is a significant factor. Surface quality is affected by a number of considerations, as you know, in addition to the chemical composition. Sulphur, of course, is one factor in the control of semi-finished surface quality, and there is an advantage perhaps associated with the lower sulphur content of oxygen steel, but there are other factors, such as molten conditioning, pouring factors, which also have an effect on surface quality, and here the operations are conducted exactly as in the case of the open hearth steel. I wouldn't say the yield is significantly different, at the semi-finished state.

MEMBER: I would like to ask Mr. Emerick for his personal appraisal as to the relative weighing of these factors that improve the ductility of the low carbon steel — in other words, the sulphur level, the nitrogen level and residual. How would you weigh the relative effect in the improvement of basic oxygen over open hearth?

MR. EMERICK: I would say that in the first position the nitrogen content is probably more significant than in the other two. We can average at least a point lower in oxygen steel, which is about 25 per cent lower actually since open hearth steel will normally be in the neighborhood of .004 to .005 nitrogen. We have produced many oxygen heats with .002 per cent nitrogen. Here the characteristics are excellent.

Next, I would rate the advantage imparted by lower sulphur content with corresponding segregation of sulphur in the ingot, and lastly the advantage imparted by lower residual alloying elements.

At J. & L. residual alloying elements are normally quite low. At other plant locations this could be a bigger factor than it is with us.

MR. GARRETT: Are there any more questions?

MEMBER: I think, Mr. Chairman, first, Mr. Emerick and Mr. Kreisberg should be congratulated on having presented a paper somewhat out of the usual, and it is evident that it is something we should have followed more often, because the discussion has certainly indicated that there is interest in the association in steel making.

You mentioned just a minute ago the control of nitrogen levels. I was wondering if you could expand a little on the nitrogen values you might expect in comparison with open hearth steel?

MR. EMERICK: First, let me say that the reason for the low nitrogen values, of course, is due to the fact that extremely pure oxygen gas is employed, so there is no nitrogen contamination of the molten metal brought in by air.

A second factor involved is the extreme turbulence which exists inside the furnace during the course of refining operation, and such nitrogen as may come in through scrap or hot metal would to some degree be eliminated in gaseous form.

The comparison with nitrogen contents typical of other processes, in acid Bessemer practice the normal range of nitrogen content is approximately .1010 to .108 per cent. This is because the refining is conducted with atmospheric air containing nitrogen, part of which is dissolved in the molten bath as refining progresses.

Duplex open hearth steel will normally range from .006 to .010 nitrogen content. Scrap hot metal open hearth steel will range from .004 to .006 per cent typically, and oxygen steel will range from .002 to .005 or an occasional .006, and these higher values when they occur can usually be associated with the necessity for reblowing the heat at the end point, which occurs in a certain percentage of our heats, but means are available to control the nitrogen pickup during this stage. During recent months means have been found to control nitrogen pickup during a cycle which is necessary in oxygen steel mills. You will seldom exceed .004 in oxygen steel.

MEMBER: Copper was mentioned as one of the lower residual elements found in basic oxygen heats. What is the average copper content of your basic oxygen heat and how does that compare with comparable grades?

MR. EMERICK: Well, the average copper content would be .01 or lower, maybe .02.

MR. KREISBERG: On welding wire it would be .03.

MR. EMERICK: The maximum copper content of oxygen steel would be .03. What you may find in other processes is strictly related to the kind of ores you have charging in the blast furnace and the kind and amount of scrap used in the open hearth charge, if you are referring to open hearth steel as the comparison process.

I have seen open hearth steel up at .25 residual copper, and some of you have probably seen it a lot higher than that. Values of .10 to .15 are more or less typical of open hearth steel where you are using bundle scrap in the open hearth purchased on the outside.

But in this process, with 25 to 35 per cent of the total mechanical charge as the normal scrap addition, we use only domestic scrap and we make relatively small amounts of copper-bearing steel at the plant, so we would be consistently under .03 copper.

MEMBER: You said 53 per cent of your oxygen steel was used for welding wire. Is that due to the fact of the poor results or what?

MR. KREISBERG: That is not 53 per cent of the total tonnage. The rod and wire gets 10 per cent or a little more of the tonnage. In this the welding wire was the natural because of the heat, control of sulphur and the results were good.

MR. GARRETT: I am sure Mr. Emerick or Mr. Kreisberg would be glad to answer any further questions. But we have to get on with the program. I appreciate it very much, gentlemen.

PAPER: "High Speed Rod Rolling" — by E. L. Chamberlain, Div. Supt., American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

MR. GARRETT: Thank you very much, Earl.

I received a note, from one of the gentlemen I passed this paper on to, and he has a series of questions here, I would like to put to Earl, and see if we can get some answers.

The average finishing temperature of five rod, high carbon, how does No. 23 stand?

MR. CHAMBERLAIN: That is approximately 1525 to 1550. We are endeavoring to lower that.

MR. GARRETT: How much is this reduced to the descalers, and what water pressures are used?

MR. CHAMBERLAIN: We are losing, I would say, 200 degrees possibly from the last finishing stand in the reel.

MR. GARRETT: How much further is the temperature reduced if the reels have forced-air cooling?

MR. CHAMBERLAIN: That is a hard question to answer, because we have been doing a good bit of experimenting with the air-forced air in our reels. We can bring the temperature down, I would say, probably to 1450 with the forced air, but we have run into numerous problems of different structure throughout the large coil. Our coil is about 28.90 and 38 to 40. In fact, our fly rod coil is about 30 inches high, so we have a high compact coil and we have had some problems trying to cool that properly.

MEMBER: How many men do you have to judge it, operate the mill and get the rod and store it?

MR. CHAMBERLAIN: There are approximately six men in the billet yards that supply the billet mill, 17 on the mill itself, and 22 in the inspection department.

MEMBER: May I ask, how does the scale on your 5 rod compare with what you had on the .301?

MR. CHAMBERLAIN: I think I can answer in this way, that we are able to control our scale on low carbon, and that is one thing on which we have concentrated, anywwhere from ½ of 1 per cent to about 1¼, where we can control it. It is done with air on low carbons and our scale of water pressure.

MR. GARRETT: Thank you very much. (Applause)

PAPER: "Work Sampling in a Nail Mill" — by J. T. Weir, Statistical Eng., American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

MR. GARRETT: We are now open for questions on Mr. Weir's paper on "Work Sampling."

MEMBER: What kind of descaling units do you use?

MR. WEIR: I am not an expert in the equipment used but the descaling was done in front of the wire drawing equipment, as the wire was being drawn, and I think there were four or five sheaves and two planes. two planes.

MEMBER: I would like to ask either of the last two speakers as to what extent they feel that statistical sampling techniques could be applied to the problem of product inspection where normally 100 per cent testing is performed in a wire mill, let us say, where you are pulling tensile tests on every coil of steel where there is an application for statistical sampling in saving money invested in this product?

MR. WEIR: Oh, yes, in situations where you can cut a sample it has been proven that statistical sampling is probably more accurate and more efficient than 100 per cent sampling for a variety of reasons. First, where you have a continuously extended thing like a coil of wire or strip, that has really been a tough problem — in fact, the AISE and several other societies have committees set up to study some type of sampling for continuous extended product where you can't cut them, but where you can get samples, for instance tensile samples, usually it turns out that the statistical thing you are measuring is more reliable than the 100 per cent.

MR. DAVIS: Mr. Emerick, I think one way to answer your question would be this way: Say, a blank has grown up — that is, as we know it, as a result of, well, Military Standard 105 A, Dodge Roemling Tables, etc., the primary idea behind these sampling tables that you have made a bolt or a nut, you have a discrete piece or pieces, thousands of them, you have a way of handling them and a way of taking a random sampling, which is, number one, a prerequisite to the sampling as we know it. The second one is that the characteristic that you are looking for — that is, that element that you want to evaluate — is supposed to be randomly distributed.

As soon as you step out of the bolt and nut business, if you will, and go into a continuously extended product, which we all are here, you just can't fulfill practically No. 1 requirement in taking a random sampling. Usually handling, economically handling, are the things that get in your way, but probably most important of all is that if you are looking for a pipe it is a little bit bias and it stays in the hot top and doesn't distribute itself throughout the ingot, and therefore the characteristic pipe that you are looking for is not randomly distributed.

When you approach sampling in continuously extended products, the answer is I think it can be done, but I think it takes a great deal of study between the operating people, the metallurgical people and the quality control people, and you usually do not end up in the same ball park that you expect to if you were using Military Standard 105 A. There are many, many other considerations that have to be made, but in the end it can be done.

MEMEER: I would like to ask the last speaker if statistical sampling inspection is used in the steel mill with which he is associated, and if it is, whether he would care to comment on the AOQL that has been developed.

MR. DAVIS: That is something that I, myself, do not become involved in, because I work primarily in the laboratory, where I am more concerned with the design of experiments. I know they do use statistical inspection, but I can't give you the details.

MR. GARRETT: Are there any further questions, gentlemen?

That was our final paper for this morning. I appreciate very much your attention and interest. This closes the Ferrous Technical Program for this year. Thank you, gentlemen.

NON-FERROUS DIVISION DISCUSSIONS

9:00 A.M., OCTOBER 13, 1959

MODERATOR

David M. Schmid, Pres., Techalloy Company, Inc., Rahns, Pa.

PAPER: "Trends, Copper and Copper Alloy Rod and Wire" — by Richard J. Christine, Metallurgical Mgr., Torrington Div., The American Brass Co., Torrington, Conn.

CHAIRMAN SCHMID: Dick, that was a real eye-opener. While some of the people here are getting their questions ready, I have a question: this subscale you mentioned on zirconium and chrome copper alloys; can that be scalped off?

Also, could you eliminate it by vacuum annealing? Is that taking place in the annealing operations, a combination of hydrogen and chrome?

MR. CHRISTINE: It is primarily taking place in the annealing operation, and the depth is not too great. Normal scalping will take it off, although you may have ups and downs, you may miss a little bit of it.

But you get into problems in scalping — in other words, let's say you are at three-quarters diameter, and you solution anneal in a normal furnace, you do pick up scale — also it can be picked up in extrusion. You can eliminate that by scalping at, say, three-eighths.

Now if you are going down into a wire of one-eighth diameter, you are probably going to have to solution anneal up around three-twelfths, let's say, and that may present a problem in scalping. It also presents some other problems as you go down in wire diameter down to, say, .093 with conventional furnaces.

If you start at .165 or somewhere around there and solution anneal, you may have a problem of trying to get the coil apart. You can use salt baths, which do eliminate a lot of this subscale formation.

Another problem is in extrusion. Your extrusion temperatures are very high because a lot of people quench directly from extrusion. In other words, if you extrude at, say, 900 to 1,000 degrees Centigrade, and then quench directly from the extrusion machine and go into a water bath, you can pick up an appreciable depth of subscale from this extrusion operation. And the subscale in this case looks like a half-moon effect where you have some scale marks from the outside of your billet.

The subscale that comes from annealing is much more uniform and will be found around the outside periphery, as against this extrusion defect which is normally in this fashion.

So you do have the two problems of process difficulties.

CHAIRMAN SCHMID: Has vacuum annealing ever been tried?

MR. CHRISTINE: Not to my knowledge on any production scale. You see, you can get away from those problems by setting up the facilities to specifically deal with them, such as salt baths, and then you have to clean them.

So actually, if you can convince somebody to spend enough money to process these, then you get around all these problems. You can take your billets and extrude them under atmospheres, et cetera. I mean, it is very easy — but it costs money.

CHAIRMAN SCHMID: That is usually what the boss doesn't like to spend. But, of course, sometimes you have to spend it.

MEMBER: On the subject of subscale, what kind of magnification would you have to look at in order to detect it?

MR. CHRISTINE: Actually, if you have a good sample in a cut section, cut through it, you don't need very high magnification. 75 diameters will pick it up. You see it as a line. But you have to have a good flat polish, otherwise you will never spot it. It is only in about 15 or 20-thousandths.

MEMBER: This is in rod?

MR. CHRISTINE: This is in rod form. You find it in tubing, too.

MEMBER: Do you find it in fine wire?

MR. CHRISTINE: Also in fine wire. You can pick it up very easily because the minute it hits the polishing discs it flakes, and you know you haven't gotten rid of it on the way down. It will flake off. It is just as though you had a skin scale, or a soil.

MEMBER: What type furnaces do you use for melting the chrome copper?

MR. CHRISTINE: Are you talking about actually making the chrome?

MEMBER: The making of the finished product; your three-quarter, or whatever you make.

MR. CHRISTINE: Up until recently we have been using a high-frequency Northrup type furnace.

MEMBER: Have you tried the regular Ajax?

MR. CHRISTINE: The regular Ajax with the modified slot is doing it presently. You have to modify the slot.

MEMBER: In modifying the slot you are trying to get rid of a lot of the turbulence; is that the idea, breaking the surface?

MR. CHRISTINE: What happens is you build up a chrome — it's a messy thing. Anyway, it will freeze your slot and you lose the furnace, short it out.

MEMBER: Do you cast under atmosphere?

MR. CHRISTINE: No, we don't.

MEMBER: Do you stay away from shock; keep away from your carbides?

MR. CHRISTINE: Right. That is one of the big problems, carbide formation. If you can use three or four different fluxes — I saw them casting at the Wheeling Works and they were using a conglomeration of borax. You can use any of those.

MEMBER: You mentioned scalping in relatively small sizes on these hard alloys. What type of dies do you use? Do you use any lubricant on them?

MR. CHRISTINE: On the small sizes that is a problem. We don't like to die scalp. You get into too much ripping, so that you would normally try to put in the scalping operation around three-eighths so that as you go down lower in your wire diameters, and if you do pick up the subscale, you are in trouble because you didn't get a good scalp on it. Like trying to scalp .165 wire, it is rather difficult.

Normally we do not use any lubricant on the scalping.

MEMBER: Do you use carbide or do you use steel?

MR. CHRISTINE: Carbide. And we use that at a sharp angle.

MEMBER: Have you ever tried fluted scalping dies, such as General Electric developed?

MR. CHRISTINE: I think what you mean is the serrated ones. Yes, they have used those.

Also they have used the other types where you actually put a chip breaker on, or a chipper in front of it, a spiral. That is used quite a lot in copper. But salt baths get away from scale formation and is the best solution.

You have got another problem, too, of grain structure to contend with. That has been one of the difficulties. The thing to control is the graining of the alloys.

Of course, the minute you put the chromium into solution — boom!

MEMBER: In connection with this continuously cast copper rod, and let us say it is cast at three-quarters inch diameter, is that then fed into a tandem hot-rolling unit?

MR. CHRISTINE: This is not what I was talking about. The ones that I have seen have been bronzes, phosphor bronzes, tin bronzes, and they would go into a cold breakdown roll stand. I haven't seen coppers, but I understand somebody is doing something with copper.

These are all very hazy, but if anybody is interested in the developments on continuous casting Dr. Hermann has recently published a book in German, "Handbuch das Stranggeisen."

I don't know what equipment they are using, but he has everything in there. You just go down the contents and if you want any type of furnace, methods to move your material, you just go to that and pick out any one of these designs. You might work on it, modify it, and you have a continuous casting machine. He has it all in there, right up to date.

MEMBER: Who is doing the casting on the Properzi?

MR. CHRISTINE: You mean for aluminum?

MEMBER: For copper rods.

MR. CHRISTINE: I didn't say anybody was casting copper on a Properzi. I used that as an illustration of what has been done in the aluminum industry; of continuously casting wire and then feeding it directly into rolling equipment.

These other continuous casting machines are being publicized in the trade journals. Riverside has a machine for the continuous casting of wire. We see these products in our own Toronto plant. We are buying some of this continuously cast phosphor bronze from Enfield. I think they are in the market to sell anybody. They also cast strip, too.

CHAIRMAN SCHMID: You mentioned residual oxygen as causing brittleness in some of these copper alloys. Can you degas that in vacuum to eliminate that?

MR. CHRISTINE: In the straight coppers, and I was referring to those, I would assume that you could degas the oxygen. But if you are talking about a free-cutting copper, which would have lead, tellurium, or sulfur, in the case of the lead, I know you wouldn't have any alloy left if you degassed it that way.

Commonly you put in phosphorous or boron, one of those common deoxidizers, and if you control it close enough, keep your phosphorous very low, you don't hurt your conductivity too much. If you use boron, why, you only knock the conductivity down a matter of one or two percent. It is hardly noticeable, actually.

We use boron to deoxidize our leaded copper. It doesn't change the conductivity too radically.

MEMBER: Concerning this subscale, again, how would that affect the platability of the rod?

MR. CHRISTINE: I suspect you would have trouble plating. With most of the plating solutions you might remove enough of the outside or you might actually do some gassing or penetration into that scale, and I don't think you would have too good a product. It might be erratic.

In other words, you might scratch your head quite a bit to find out what was going on; checking plating pans, solution, temperatures, et cetera. It might be something like a subscale — you would run into problems.

CHAIRMAN SCHMID: A good job, Dick, and we will have you back again sometime.

PAPER: "A Substitute for Silicon Bronze—Its Fabrication and Properties" — by Roger Martin, Chief Met., Triangle Conduit & Cable Co., New Brunswick, N. J.

CHAIRMAN SCHMID: Any questions?

MEMBER: May I ask, Roger, since this is basically a modified commercial property, have you done any work yet to see what would be the comparative dezincification, loss in strength, in the stress corrosion?

MR. MARTIN: I thought of that. The only trouble with a 90-10 is it wouldn't meet the strength requirements and so what is the use of testing it? We are just combining — we know that 90-10 has good qualities for resisting these. That is why we chose it — plus the silicate modification.

MEMBER: You mentioned that you thought the ten-percent zinc addition might make the alloy more resistant to sulfur corrosion.

MR. MARTIN: To sulfide, yes.

MEMBER: Have you tested that out?

MR. MARTIN: I haven't tested it, but I have had a lot of past experience whereby small amounts of zinc have had great influence on alleviating sulfide corrosion.

In fact, in your condensor tubes, if you suspect sulfide corrosion, you never use a high copper alloy; you always go to your lower copper, high zinc.

MEMBER: That is correct, but it is usually much greater than ten percent.

MR. MARTIN: That is true. But every little bit helps, as they say.

MEMBER: You might be interested to know that we have an old alloy called silicon red brass.

MR. MARTIN: Yes, I know of that.

MEMBER: That has been used quite extensively for Well-screen Wire.

MR. MARTIN: What is that?

MEMBER: You are familiar with the Keystone type of wire?

MR. MARTIN: Yes.

MEMBER: It is used in conjunction with certain applications where the normal composition is not quite as suitable, because of its corrosion resistance.

MR. MARTIN: That is what I was trying to point out.

MEMBER: It would seem that the thinking which led you to the development of this alloy was pretty close, was rather comparable with the thinking of your company in the developing of this 30-percent conductivity alloy which was recently accepted by Committee B-105.

MR. MARTIN: That is true of the ten-percent alloy.

One more thing I wanted to say is that it was unfortunate that these graphs were not available at the time the report was published. I have about three dozen of them here for anyone who might want them. If we run out, if someone will leave his name, I would be glad to see that copies are made available.

Also, I would like to have these graphs published as a supplement to this paper because I feel they form a valuable addition to this new alloy. (See Figs. II, III & IV)

Figures II and III show the comparative corrosion resistance of Silicon Brass and Cartridge Brass, used as a control, under conditions producing dezincification and stress-corrosion respectively. Figure IV is a sketch of a jig we designed to stress the samples in the cross-section experiment. Since we annealed both the Silicon Brass and the Cartridge Brass to the same yield strength, 20,000 psi, it was then just a matter of bending one sample of each alloy the same amount by means of the micrometer screws shown in the jig in Figure IV and suspending the jig in fumes from a 25% solution of ammonium hydroxide placed in the bottom of a battery case having a loosely fitting cover to allow free access of air. The ends of the samples in contact with the jig were covered with insulating tape and a piece of plastic was inserted between the screw and the sample to prevent any possibility of galvanic action.

MEMBER: In what conductivity range does that alloy fall?

MR. MARTIN: The range is somewhere in 12 to 15, depending on the silicon content and the temperature.

MEMBER: What actual physical properties do you supply for heading? For example, bolts.

I am thinking, again, of your mine sweeper. Obviously, that is for screws. What is your screw temper?

MR. MARTIN: We don't make that. The Bristol Brass Company made this, and I believe they were supplying at somewhere around 85,000 psi.

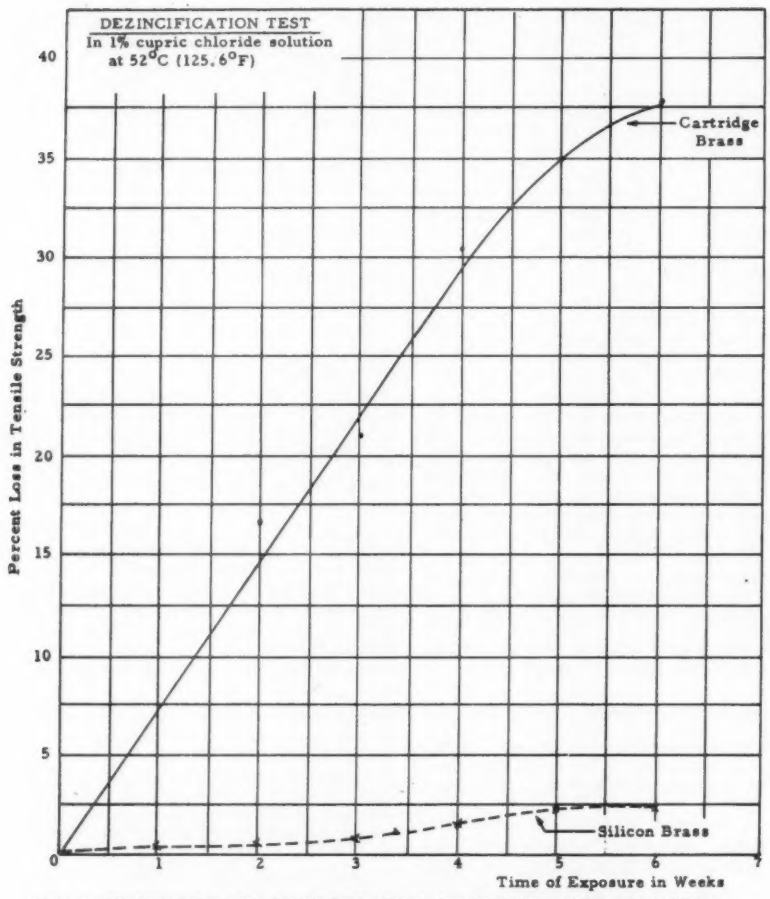

FIG. 11 SHOWING COMPARATIVE DEZINCIFICATION RESISTANCE OF SILICON BRASS (SILCALLOY) WITH CARTRIDGE BRASS

MEMBER: In other words, they were meeting the minimum of the spec?

MR. MARTIN: Yes, 85,000 or 90,000, somewhere in there.

But some samples were supplied to the Navy — I am not allowed to say too much about this — but in their tests — they were all right. That is as far as I can go.

MEMBER: Weren't the properties the last man is asking about incorporated in the two Government Specifications you mentioned?

MR. MARTIN: I believe they are. I have something on that here. Let me see if I can dig it out. Here it is. Navy Spec Mil-C-17516, Alloy No. 2, Wire — which is the one we were mainly interested in. We are wire manufacturers.

For quarter hard, which is 20 percent cold reduction, both the Mil-C-17516 and the QQ-C-59 Lb require 60- to 75,000 psi.

MEMBER: Yes, but your bolt and screw specification is a lot higher than that.

MR. MARTIN: Yes. Bristol Brass supplied samples, which were tested by the Navy and found to be satisfactory. As I say, I can't say any more about those tests. I can't advertise.

MEMBER: Was this material tested in stress corrosion at or near the yield strength?

MR. MARTIN: Yes, it was near the yield strength. And they were comparable because the yield strength in both cases, one was 19,500 and the other one was a little better — the Cartridge Brass was about 21,000.

The reason that we tested this in an annealed condition was that it was taking too long for them to crack and get any comparable results in the hard condition.

MEMBER: Don't you think that you have automatically set up a limitation because it is normally with the applied stresses to an already cold-worked material that you have failures, rapid failures, in that type of an installation?

MR. MARTIN: We couldn't get the thing to crack when they were hard worked.

MEMBER: If I might comment on that, we have found that the silicon-bearing materials will crack at just something less than their yield strength in 1,000-hour tests. But these are tests where they are stressed at or just below the yield strength.

MR. MARTIN: That is right.

MEMBER: That is the operation of the test. Did you ever extrude?

MR. MARTIN: No, we hot-roll.

MEMBER: Do you have any experience in extruding this alloy?

CHAIRMAN SCHMID: Could it be extruded?

MR. MARTIN: I would say it can because they extrude regular silicon bronzes. I would say it could be.

MEMBER: Would you say it would have the same extrusion defects that you encounter in silicon bronzes?

MR. MARTIN: I couldn't tell you that. It depends on your method.

MEMBER: But wouldn't the alloy be more similar to the silicon bronzes?

MR. MARTIN: No, I think it would go a little bit more toward your brasses. You may have a little better luck on that.

MEMBER: I think I can answer his question. We extrude 85 modification. In other words, it is very close to this, with approximately the same silicon content. We call it silicon red brass, and it extrudes more like that Everdurs. You have to use quite a bit more pressure, and you get the same sort of bark condition if you are not careful.

MR. MARTIN: You spoke about your alloy. We had quite a bit of a time getting the Navy interested in our alloy because they said that one containing about 80-percent copper and one or two-percent zinc, one or two-percent silicon, and the remainder zinc, failed quite badly by dezincification. But after some talking, and a lot of persuasion, they tested it out. It worked out pretty well.

PAPER: "Recent Developments in Aluminum Alloy Wire" — by Charles L. Kessler, Chief Works Met., Aluminum Company of America, Massena, N. Y.

CHAIRMAN SCHMID: A real good job, Charley. I see that alumiunm is competing with galvanized wire now in applications. What is the comparison pricewise and propertywise, of aluminum wire versus galvanized wire?

MR. KESSLER: Really, I don't have to answer that one because we have got our Wire Product Manager here. I am going to call on Bob Adams.

MR. ADAMS: That is an extremely difficult question to answer, gentlemen, because we in the aluminum industry try to tailor our wire to fit the customer's individual needs.

Should I say that the major application today is the chain link fence. That sells for 38 cents a pound, our commodity price today. What the price of galvanized is on a poundage basis or a footage basis, I can't tell you. But we are competing in the finished product, so I would say that they are very close.

Generally, shall we say, we depend upon other attributes of aluminum rather than price to compete with the gentlemen in the other fields.

CHAIRMAN SCHMID: I am thinking that scalping — is that cheaper than that chemical cleaner where you can use them alternately? I know the chemical cleaning works on specific alloys. But where either can be used, which is the cheaper?

MR. KESSLER: Chemical cleaning has a limitation in that it is necessary to spread the wire out on a carrier so that the chemical can contact the entire surface. When you get down to the smaller wire size, this becomes quite a chore in insuring that the wire has been adequately separated and, of course, you get a very small load in the tank. In that case, the cost becomes prohibitive.

I would say if you tried to chemically clean in wire sizes below an eighth of an inch you will find that the cost exceeds what you can do by shaving.

CHAIRMAN SCHMID: Is the metal loss about the same?

MR. KESSLER: The metal loss is the same, yes.

MEMBER: Do you use chip breakers in that scalping operation?

MR. KESSLER: Yes, we do.

MEMBER: In that experimental alloy, how much magnesium do you have? Is it down

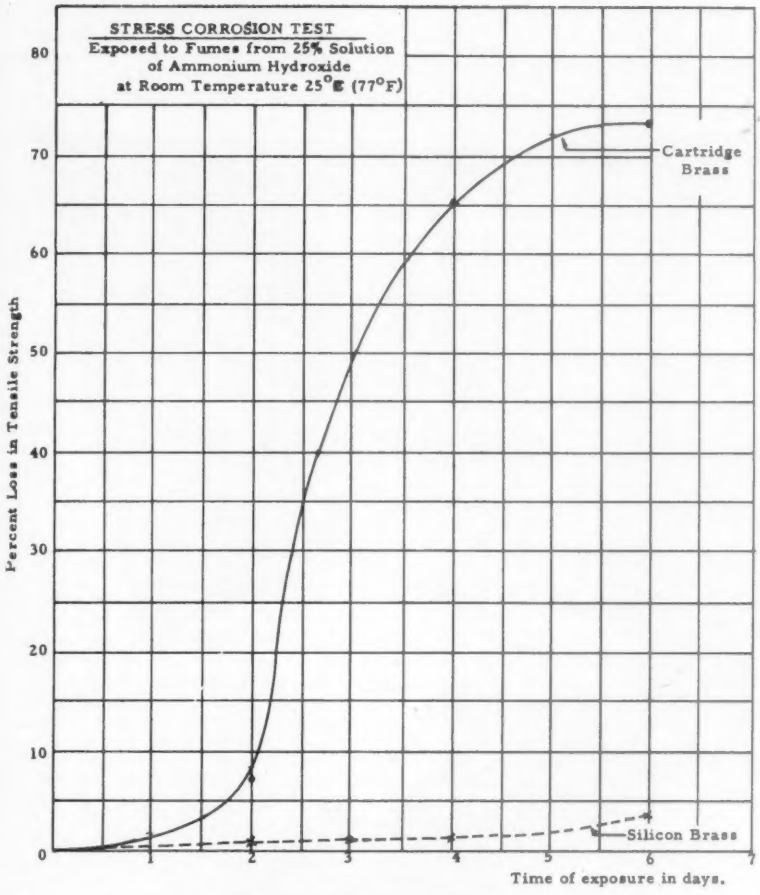

FIG. III SHOWING COMPARATIVE STRESS CORROSION RESISTANCE OF SILICON BRASS (SILCALLOY) WITH CARTRIDGE BRASS

around seven-tenths, in that range, or lower?

MR. KESSLER: It is just below one percent.

MEMBER: Just below one — like 5457.

MR. KESSLER: Like 5357.

MEMBER: You have another experimental, I think, X-54 or something.

MR. KESSLER: We have a new one every day.

MEMBER: On chrome plating the aluminum, how well does that prevent corrosion as far as chemical attack of the aluminum?

MR. KESSLER: It does a very adequate job. I am not an expert on chrome plating, but I would say that our chrome plating process for aluminum products is designed to get a continuous layer of chromium over the product, and when this is done it gives you excellent protection. It is no better, of course, than the anoded coating you can put on.

MEMBER: Would you repeat what you said about the physical properties of the alloy with boron in it, and also indicate where you are using that?

MR. KESSLER: EC grade aluminum is used in the conductor industry. The greatest tonnage goes into stranded all-aluminum conductors and aluminum conductors steel reinforced. These have the steel core for strength and the aluminum for conductivity.

The one that was illustrated at the top of the last slide, the expanded aluminum conductor, steel reinforced — those are the major applications. And some of these products are covered with either neoprene, polyethylene, or other compounds, such as polyvinyl chloride.

MEMBER: Is that where the boron is employed?

MR. KESSLER: Yes, to increase the conductivity.

MEMBER: It appears as though, from the cut that you had, you were shaving it around 300-thousandths. How much are you removing?

MR. KESSLER: We remove about five percent of the cross sectional area.

MEMBER: That would be about five-thousandths?

MR. KESSLER: At 300-thousandths that would be in the neighborhood of three- or four-thousandths.

CHAIRMAN SCHMID: Thank you again, Charley, for a job well done. We appreciate your coming out here and we want to have you back again.

2:00 P.M., OCTOBER 13, 1959

MODERATOR

Henry McConnell, Wire Plant Mgr., Sylvania Electric Products, Inc., Warren, Pa.

PAPER: "Tension in Wire Engineering" — by Erwin J. Saxl, Pres., Tensitron, Inc., Harvard, Mass.

JIG USED IN STRESS — CORROSION EXPERIMENT

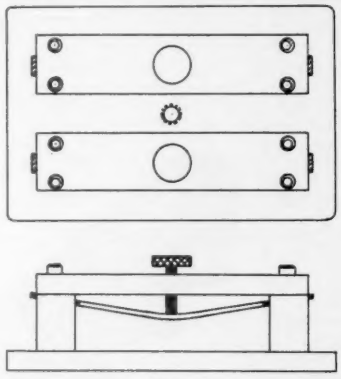

FIG IV
SCALE - HALF SIZE

NOTE: Figs. III and IV relate to Mr. Martin's comments recorded on page 79.

CHAIRMAN MCCONNELL: Now I am sure Dr. Saxl will be very interested in receiving and answering any questions you might have.

MEMBER: One of the problems we have with any instrument of this type is knowing whether or not it is operating properly, which brings up the question of calibration. Will you give us some tips on how these instruments could be calibrated so that we know on a day-to-day basis they are operating correctly.

DR. SAXL: Your point is excellently taken. We have gone through very great difficulties in bringing about standardized calibration.

Most of the time — for the finer wires, at least — you can put into a reasonably definite correlation the tension on a highly flexible thin yarn or highly flexible thin cable with the tension of the instrument. Actually, the trigger instrument is most of the time calibrated against the highly flexible yarn, such as Cortura, with a weight on it. But we make sure that we move the instrument; then we have 50 grams hanging and 50 grams indicated. Then we have comparative conditions.

That would not be enough for an instrument that has to go as high as 50 pounds. As a matter of fact, in our last instruments we went as high as 100 pounds. What we use for the calibration here is a highly flexible aircraft cable, one-sixteenth of an inch in diameter, that is loaded with dead weight. Again, the material is kept in relative motion to the instrument, which is moved so that we have it under reasonably dynamic conditions so that we can establish dynamic conditions for the deadweight test against the calibration.

However, this is only one part of our tests. Most of the time that is all that is necessary, and it is the easiest way for a person to recalibrate an instrument when in doubt.

We also have a dynamic test, whereby we pull wire off the material and go through an absolute tensioning device. That runs at any reasonable speed. If at any time it is required to calibrate the instrument against the running wire, tape, or yarn, we can do so, too. This is more complicated, more involved, time-consuming, and more expensive. It can be avoided, is unnecessary in many instances; however, where required we do

designers and manufacturers of machines for electric cable wire rope and soft rope production

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have the dynamic tests.

MEMBER: At the end of the day, how do you measure the tension in the wire mill superintendent?

DR. SAXL: Very simple. If he relaxes after one cocktail, it wasn't too bad. (Laughter) Then it goes up. (Laughter)

MEMBER: Very good.

DR. SAXL: But that is the spiritual part of tension determination. And, after all, even water is nice if taken in the proper spirit. (Laughter)

MEMBER: What kind of a price range do you have on these instruments?

DR. SAXL: This is not a sales talk here, please — but since you ask the trigger instrument starts at $125.00. The lever instrument goes up to $250, and the little control is $85.00.

MEMBER: What do you call the little instrument there?

DR. SAXL: An electric tension controller.

We use it on cable-winding machines. We have used it on one of these tricky operations, and this is one that can be mentioned in the non-ferrous section. Namely, one of the most critical wires to work is enameled platinum wire, used in guided missiles. The enamel does not like to stick to the platinum and anything in terms of a frictional tension scrapes the enamel off.

However, we have found that the smooth elastic cover transfers the motion of the enameled platinum wire, without damage to the wire, onto the rotor and then we can retard it electrically. For critical tensioning, electric tension, without stress concentration, good stress distribution over a long area of wire is the answer.

MEMBER: Often there is an electrical potential associated with the wire being measured. Has any consideration been given to insulating these devices?

DR. SAXL: They have been at times insulated. There is no question but what your point is very well taken. This is so not only from the viewpoint of the electrical potential on the wires themselves, but also I have purposely — for the purpose of simplifying the problem — disregarded many factors that do influence wire. I have mentioned the poisson ratio. I have not mentioned that the resistance changes, that the magnetic domains and the specific heat changes, that a lot of other things happen, and that even currents can be generated due to tension in wire, particularly in certain types of alloys.

I also have not mentioned the fantastically interesting similarity of certain wires used in strain gauges, which are similar to mine-span wire. Not only do these have enormous stress and strain ratio, but also are practically unaffected by the temperature and the electric coefficient. That goes, however, into terms of analysis of physics of the solid state; it goes into a gauge manufacturer's domain.

MEMBER: How about from the point of view of operator protection from electrical hazards?

DR. SAXL: As you see, here is a plastic insulating cover. We have at times covered the rest of the instrument also. It is entirely possible to make it in a manner that is safe and yet permits the taking of precise readings.

MEMBER: What are the tension ranges, the smallest tension ranges available to the reel instrument there?

DR. SAXL: About five grams. It can be made even less.

In other words, you are a wire man but you do know that much of our business is in the textile industry. If you want to go to the most sensitive nylons that are used in my lady's hosiery, our tension controls have been used for as fine a material as 15-denier nylon.

MEMBER: Is that tension meter set on a stationary wire, or is that calibrated over a maximum range of speed?

DR. SAXL: We have done both. Ordinarily, we calibrate for one speed, but we can calibrate for a set of speeds. It is important to introduce such things at times because when you deal with a wire, say in the mechanical shunt 3-wire arrangement, you not only measure tension you also measure stiffness, which means deflexion, and then what you actually are doing is — you have a neutral axis on your material, and you have tension here, and you have compression below, and as you bend this you do work. Therefore, the faster you run it the more work you do, and this work is indicated in terms of tension — although it is actually stiffness.

MEMBER: In other words, you might be pulling, say, at 50 grams 1,000 feet a minute, but your Tensiometer would be 50 grams.

DR. SAXL: Calibrated to the same wire at 1,000 feet per minute it will, yes. We do make dynamic testing when required.

CHAIRMAN MCCONNELL: Are there any other questions? Thank you very much, Dr. Saxl. (Applause)

2:00 P.M., OCTOBER 13, 1959

PAPER: "Some Metallurgical Factors in the Manufacture of Fine Wire" — by C. M. Jackson, J. G. Dunleavy & A. M. Hall, Alloy Development Div., Battelle Memorial Insitute, Columbus, Ohio.

CHAIRMAN MCCONNELL: To start the questions, I would like to ask what materials have you been working with; can you divulge that information?

MR. JACKSON: I think as long as I speak in generalities I am all right. We have been working with nickel base alloys, iron base alloys, as far as stainless steel types and other super alloys, and alloys that are used for precision electrical uses, and some copper base alloys.

MEMBER: Could you identify the inclusion in Figure 4, where you had a rectangular bit of titanium carbonitrate?

MR. JACKSON: Yes. That was a stainless steel and that titanium was added as a part of its deoxidation practice. Actually, it would look the same no matter what it was in. The shape is a characteristic of the titanium carbonitrate.

MEMBER: How did you find that particular particle in there?

MR. JACKSON: In this particular alloy there were a lot of them. They were not quite that large, but very close to it.

Actually, we don't need very many of them to cause breaks that are quite expensive to the wire drawer. But we have seen some cases where there are many, many of that size, or very near that size.

MEMBER: The next time I get a lot of breaks in fine wire or stainless wire, I want to know, is there a quick, easy, simple way I can tell right down on the fine wire machine whether it is due to inclusions, bad wire, exceeding the safe hot-rolling range on stainless, or some of these other reasons that you brought out.

MR. JACKSON: We are at times called upon to do this. I know just how you feel.

CHAIRMAN MCCONNELL: That was a loaded question.

MR. JACKSON: Yes, I think it was.

It is usually very difficult to do unless you know the exact history of the material. Actually, the only way that we tracked down that last one there with the mottled surface is that we had a complete record from the company that rolled the material. Without this record, it would have been quite difficult to tell whether it was caused by that or by something else, although we would have expected that it was probably something like that — although we wouldn't expect someone to make such a boner, really.

Usually we use a metallographic examination, of course, of both the surface and inside.

I know how you feel. It usually is quite difficult to pinpoint it.

MEMBER: Have you people run any evaluation on continuous inspection instruments of the current eddy type and have you found any correlation between the picture shown by these instruments and performance in a fine wire drawing machine?

MR. JACKSON: I am sorry, but as far as I know we haven't done any work on that. It is possible that one of the other divisions of Battelle, the non-destructive testing division might have done some work on it. If they did, I am not familiar with it.

MEMBER: We are producing redraw rods by the continuous Properzi process and we are using a Magnaflux, which shows a very definite correlation. We found a big improvement in our material since we started using it.

MR. JACKSON: Thank you.

CHAIRMAN MCCONNELL: Any more questions? I have one. I probably shouldn't ask it, but there often arises a situation whereby the wire-drawing man draws a wire until he can't draw it any further, and the metallurgist says that he has overdrawn it and ruptured it. Would you care to make a few comments in that area? Do you believe you can internally rupture a wire by overdrawing?

MR. JACKSON: You can definitely cause breakage, if that is what you mean by internal rupture.

CHAIRMAN MCCONNELL: Can it be internally ruptured so that at some future process you will get breakage?

MR. JACKSON: In other words, at some time during the drawing it might have been overdrawn and then annealed. Annealed too late, so to speak.

CHAIRMAN MCCONNELL: That is right. I would like a comment in that area.

MR. JACKSON: I am not familiar with that directly. However, we did talk about this one time and it appears that there is good possibility that if the material is drawn too far you might get micro cracks on the surface. I don't know the exact mechanism of the formation. This was brought up by someone else and is, again, theoretical.

I can't say it definitely occurs. We don't have data to support it. But there is a possibility you might get micro-cracks which then, when you draw the material down further, might cause difficulties. Either after annealing or during annealing you might get oxidation or nitrogen pickup along these cracks, which might then lead into the transverse breakage of the wire. And, of course, it might just break because of the cracks themselves being there.

MEMBER: Have you done any work on the effect of minute impurities in the third and fourth decimal place? In some alloys I think

that is quite important.

MR. JACKSON: That is right, particularly in some of these high strength nickel base alloys you end up with impurities — metals such as bismuth and arsenic in the third and fourth place.

Actually, we haven't been concerned with this because usually the type materials we are working with end up as such expensive products in the final size that the producer is interested in using pure charged materials to start out with.

Now I don't mean "pure," for this is a very bad term to use. "Pure" would be, of course, approaching 100-percent purity. What I refer to are charged materials, which are pure as concerns these tramp elements. So, therefore, we haven't run into that difficulty yet.

Now I imagine in production with material, for instance, that was going to go to a larger diameter and therefore would sell at a lower price, they might want to use cheaper charge materials and possibly at that time you might run into trouble.

We have made much metal on a pilot plant basis, and also guided manufacturers in setting up production of certain alloys that we have developed for them, and we haven't had any trouble with that.

MEMBER: I think you have done an excellent job, Mr. Jackson, on your paper. I thought you might be interested in the inclusion of 304 stainless.

We checked our incoming heats for inclusion gas and we found that our production results on fine wire, speaking of sizes under .010 or up, when we have inclusion heats — we have been asking our suppliers of stainless steel rods for a low-inclusion gas. Now we haven't established limits, but do you have anything that would suggest a safe limit on inclusion for stainless steel rods?

MR. JACKSON: This is difficult to say. As you know, I have been speaking in generalities. This is about all we have tried to do.

Actually, there are certain instruments that we haven't investigated for inclusion counting, as Mr. Schmid has mentioned and, therefore, if one of our sponsors were interested in establishing that we could probably go ahead and do it. But at Battelle I imagine it is like everywhere else, if someone wants something done, and will pay for it, then we do it. But our particular sponsors have not requested inclusion count specification ranges and, therefore, we haven't done it yet.

This may not be a scientific approach, but sometimes you can't get away from it.

MEMBER: After Dave's saying you have done an excellent job, and I don't want to detract from what you have said — you have a very nice paper. However, the paper touched on difficulties that can occur in drawing fine wire as resulting from a stock or method of treating the stock, but didn't touch at all on drawing practice insofar as it can produce some of these defects.

You showed a slide which had checked wire on it. Checked wire can be caused by improper drawing practice at some breakdown point, such as improper die contour, slash, or abrasion of your entering stock into your wire-drawing machine.

MR. JACKSON: Thank you. Actually, that was why we mentioned in the beginning of the paper that we are considering for the particular metal or alloy being produced that the drawing mechanics are optimum because this isn't directly our field. You gentlemen have had so much more experience than I in wire drawing that I would very much hesitate to get up here and try to tell you how to draw any particular alloy.

We were just assuming that the drawing mechanics are optimum for the particular metal. This could be the subject, of course, of other papers. In fact, it has been in the past.

MEMBER: I noticed that you mentioned hot rolling as the basis for starting the wire down the line. I couldn't help but wonder whether you considered the possibility of extrusion and, if so, whether he had any comment to make in that connection.

MR. JACKSON: Yes. Actually, we have considered extrusion for some of our relatively easily worked materials. Some of the materials, though, we haven't tried extruding because, first of all, they require extremely high temperatures — 2,000 or so.

I am told by some extrusion people that the necessary setup in equipment for that type breakdown would be quite expensive and would be beyond the realm of what our sponsors would be interested in.

We do think, however, that many of the metals could be reduced by extrusion. In fact, when we go to set up a particular newly-developed alloy in a plant, if the plant has a setup for extrusion we will try extrusion and see what happens. The main thing that governs this is the facility at the plant that is going to undertake the work.

When they use tricky alloys, I am sure you realize many companies won't even talk to you about this. They are too difficult. Or if you do go to talk to them about putting this into production they will say, "Well, now, we know how to do this. You go home." This has had disastrous after-effects. We did go home one time — and wished we hadn't.

But, definitely, extrusion can be in the picture. I think it all depends on the company and what they are doing.

MEMBER: I would like to comment on that. You can trade hot rolling imperfections for extrusion imperfections, too.

MR. JACKSON: Right. Another point along there is that usually in extrusion, where material is going to get down to fine wire — usually we scalp the surface or scarf the surface to get rid of surface imperfections before extruding. On many alloys this can't be done because you can form micro-cracks which then during the hot working, extruding, et cetera, will open up.

That is why when I mentioned conditioning it as casting — I didn't go into it here, but I did go into it in the paper. In many cases it is necessary to just chip the imperfections off with a chisel or something similar; or if you are going to grind them off, to be careful not to touch the ingot proper. There are several alloys that we found if you just touched it with a grinding wheel to remove, for instance, a scab — if you touch the metal proper as soon as you put that underneath the forge hammer, even if you hit it very lightly, as we are accustomed to doing, a crack will form — and you won't have any cracks any place else.

In fact, sometimes while you are grinding it you can hear a little "ping" which is the crack starting.

MEMBER: When you are going to draw material down to very fine sizes, you mentioned that intermediate anneals or stress relieving anneals are necessary. Is there a metallurgical yardstick that you use as to when to anneal, or is this empirical?

MR. JACKSON: As far as I know, it is empirical. Metallurgy, of course, is still in the art stage. In some cases it is towards the science — and some professors wish to think it is completely in the science. But some, at least the ones that I went to school with, said it was still in the arts, and I agree with them fully that you can't very well pinpoint these things.

Many times it isn't even percent reduction because a certain percent reduction, for instance, between the quarter-inch rod and the next anneal — if you get a certain percent reduction that is necessary, and you try to tag that same percent reduction between that anneal and the next one — many times it won't work. So I don't know of any yardstick except just to cut and keep trying.

CHAIRMAN MCCONNELL: Jim, would you care to comment on the triangular tears that we get in the center of our wire?

MEMBER: We have traced them to long-bearing dies. We have been able to pull out dies with long-bearing area, and find internal ruptures which later open up into triangular tears, which result in breakage long before you get into fine size.

MEMBER: Is this of the cuppy-type fracture or defect you are talking about?

MEMBER: It is a typical tensile break. It starts in the center, a little tear, and opens up.

MEMBER: This is old hat, of course, in copper. I think that it was in 1930 that IAME had two good papers, one by Jentzen and one by Gremmers, covering this business of cuppy wire. It was rather well-established that it was due to die design.

CHAIRMAN MCCONNELL: I think you can judge the merit of the paper by the amount of discussion. Thanks very much. (Applause)

PAPER: "Drawing Titanium and Zirconium Wire" — by Robert Knight, Sales Mgr., Johnson & Funk Metallurgical Co., Wooster, Ohio.

MEMBER: Do you use the same draft angles on your dies on zirconium as on titanium?

MR. KNIGHT: Yes, sir, we are using the same. Whether or not that is right I don't know, but it works.

MEMBER: It is right then.

MEMBER: Would you care to discuss the percentages of reduction in area that can be attained between anneals? I mean the total percentage.

MR. KNIGHT: Yes. Ordinarily we will take three 12-percent reductions and then anneal. We find that we have better success doing this. We might be able to squeeze a fourth pass out of it, but we don't like to take the chance.

MEMBER: Which titanium alloys do you hot-draw, and what temperature are they heated to?

MR. KNIGHT: We are not hot drawing any of the titanium alloys, mainly because we don't have hot-drawing equipment at our plant. We are doing everything the hard way.

MEMBER: Do you do any warm drawing?

MR. KNIGHT: No, sir.

MEMBER: On zirconium, you don't?

MR. KNIGHT: It is all cold-drawing.

MEMBER: How extensively are hot or warm drawing used in the industry? Do you know?

MR. KNIGHT: Well, as I said, there are problems and one of the main things is cleaning off the lubricant that you use for hot drawing. It is quite a problem.

I don't think that hot drawing is being used extensively. Would you say so, Bill?

MEMBER: It is not on the pure alloys of titanium, at least. On the higher alloys where you have yield strengths up to maybe 130,000, hot drawing is used, I believe, to some extent. By "hot" I mean temperatures around — well, less than 1,000. That would probably be considered warm.

MEMBER: In your annealing, I think I missed a point. For titanium it was 1,300 degrees — is that F. or C.?

MR. KNIGHT: I talked in Farenheit.

MEMBER: And was this with atmosphere or without?

MR. KNIGHT: Without atmosphere.

MEMBER: And you have no pickup of oxygen?

MR. KNIGHT: Not that we have encountered, no, because subsequent pickling will take most of the surface contamination off.

MEMBER: You pickle after every anneal?

MR. KNIGHT: No. We leave the oxide on for drawing.

MEMBER: On this hot or warm drawing, again, is there any good reason for that other than the fact that your yield strength, when it is heated up, drops faster than the tensile, or, in other words, your spread between tensile and yield becomes greater. Is that it?

MR. KNIGHT: I would say that is the important thing, yes.

CHAIRMAN MCCONNELL: Any more questions? If not, thanks a million, Bob.

9:00 A.M., OCTOBER 14, 1959

MODERATOR

David M. Schmid, Pres.,
Techalloy Company, Inc., Rahns, Pa.

PAPER: "Glass Sealing Wires" — by Robert Brenan, Senior Engineer, Sylvania Electric Products, Inc., Warren, Pa.

CHAIRMAN SCHMID: Bob, that was an excellent job; very well done, most complete and well organized.

I am sure there must be some questions, although you answered all of mine. Who has the first question?

MEMBER: Do you know of anyone who has ever tried to extrude Dumet?

MR. BRENAN: I think that that is an area which could bear some investigation, all right. I don't know of anybody right now who has proven that it can be done, but it certainly would be an area for investigation.

MEMBER: You said you used copper for your seal, and around the outside of the Dumet. The oxidation is so important — what kind of copper do you use? Do you use phosphorous oxidizing? They have different rates of oxidation.

MR. BRENAN: That is right. Normally, in our processing we have sent to the OFHC because although it is a more premium grade copper, it costs a couple of cents a pound more, we find it is less susceptible to hydrogen brittlement, for instance, or that sort of thing. That is what we recommend.

MEMBER: Since you commented on many of the defects of Dumet, I was wondering if you would care to comment a little bit farther on the leaching problem. If you don't care to, that it okay, too.

MR. BRENAN: I don't think I had better. There is a solution.

MEMBER: Since extrusion was brought up as a means of putting the copper coating on, could the copper be electroplated on?

MR. BRENAN: That was tried. In fact, Sylvania put a large amount of time, effort and work into it. I don't think it was ever proven to the people making it that it was not feasible to do it that way.

We did try, but the trouble seemed to be that the copper itself was more porous than the clad copper would be and it allowed the gas that is inherently in the 42 nickel-iron core that is placed in there during the electrodeposition of the copper — you have hydrogen liberated there, too, and we never could get it all out satisfactorily to make a bubble-free seal.

MEMBER: I might comment that considerable Dumet is made in Europe by plating.

MEMBER: But after the plating it has to be drawn.

MR. BRENAN: Yes. We did it that way — but apparently there is something there on which you could enlighten me.

MEMBER: You can also have it in oxygen-free copper. The oxide adheres much more firmly than any of the other coppers. That is one of the characteristics of the metal, adherence of the red oxides to the copper, which the other grades do not possess.

CHAIRMAN SCHMID: Thank you very much, Bob. We enjoyed it.

PAPER: "Some Age Hardenable Copper-Base Alloys for Wire Products" — by Donald E. Pardon, Design & Devel. Eng., Chase Brass & Copper Co., Waterbury, Conn.

CHAIRMAN SCHMID: A good job, Don. Thank you very much for that very good paper, well presented and well organized.

MEMBER: When you come out of your extrusion press and you are in the solution heat-treating range and you quench, this is to give you your softness for working. Then you go through your cold rolling, preparing your material to go into the wire-drawing machine. You mentioned that you put in necessary intermediate anneals. Are these intermediate anneals, in a sense, solution anneals again?

MR. PARDON: No, it is not necessary to take material up into the solution annealing range for these intermedite anneals. In effect, what they are are overaging anneals which take the material out of solution, form a precipitate, and soften the material by recrystalization. You eliminate the age-hardening feature by overaging; you soften the material further by recrystalization.

The solution anneal from the extrusion is a good idea since it is done as sort of a bonus. It gives you the maximum manageability and workability of the material. Of course, the great number of your sizes of material in the rod range would be produced without any subsequent solution anneal-quench.

MEMBER: This means that actually the material — the age-hardening alloys — are most workable in the solution annealed condition rather than in the overaged condition.

MR. PARDON: Yes, this would be true except that some conditions of grain sizes might some in. But this, in general, is true.

MEMBER: Would you tell us a little bit about the casting procedure followed in making the chromium alloys?

MR. PARDON: I wish I could. That was touched on yesterday. The chromium alloy is not cast in our mill and I really don't have any experience in this particular field.

I know that you do have a problem in forming chrome carbides if you have any carbon material. You can't use Fernex or anything of that sort for furnace cover. You have a problem with the slot in the ejection wire furnace, too.

I am sorry, I can't give you any details as to how to get away from it.

CHAIRMAN SCHMID: Thank you again, Don, for a job well done.

PAPER: "Vacuum Annealing of Wire" — by Karl H. Fritz, Director, and Georg Michael, Manager, Ofenbau Fritz G.m. b.H., Hagen, Germany.

CHAIRMAN SCHMID: A wonderful talk. Mr. Michael is a very learned man. As well as giving this talk to you in English he could give it to you in German, Italian, French, and Spanish.

Now we will have some questions, please. Who has the first question?

MEMBER: You stressed the improvement in the surface quality of copper when it is annealed but you didn't state anything about any improvement in the properties. Is there improvement in the properties of the material?

MR. MICHAEL: No, there are not. We cannot improve the qualities of copper by vacuum annealing. The advantages are on the mechanical side. And, then, you get a very, very bright surface which might be very useful if you use your copper later on for enameling purposes. There are no stains. If you take a strip, for instance, it serves really as a mirror. You can see your face in it.

MEMBER: Where did you actually tap your vacuum in the furnace? I didn't see in the picture where the vacuum —

MR. MICHAEL: There is a valve on it at the base of the pot, and you connect the hose from the vacuum pump to that valve and you draw, you effect your vacuum.

MEMBER: Do you effect base cooling in that retort also? Is that base cooled at all times?

MR. MICHAEL: Yes, it is cooled off, constantly cooled by water.

MEMBER: One of the prime advantages of the atmosphere bell-type furnace, such as we are using in this country, is the circulation achieved by a big fan in the base which gives uniformity in heating. How does the vacuum furnace compare with that?

MR. MICHAEL: I mentioned that this Fritz furnace is equipped with various heating groups inside the dome, you see, inside the vault, and these heating groups can be individually regulated. That means we get a very, very uniform temperature inside the furnace.

Now if you want to anneal, let's say, at 500 degrees, you put the lower group — how much would you say, Mr. Fritz? Well, you start with 500, 480, 460 above; below you have got 480, in the middle 460, and the higher you go up the lower is the temperature; do you see? The temperature is not on all ranges. It varies with the height of the furnace.

CHAIRMAN SCHMID: He is speaking in

terms of Centigrade. He has different temperature zones with the heat rising. We do that frequently in this country, too.

MR. MICHAEL: Regarding the fans, I would like to say this: You can also anneal bronze in this furnace. The furnace gives you no particular advantage for annealing bronze, but you can anneal in the furnace without vacuum. In that case we design or build a special pot which contains a fan in the base. That corresponds to the special device you use with protective gas here in the States.

MEMBER: If you do this in a vacuum, you get it by radiation and conduction.

CHAIRMAN SCHMID: He said that all heating in a vacuum is done by radiation.

MEMBER: And conduction of the wire itself.

MR. MICHAEL: Yes.

CHAIRMAN SCHMID: And that the fan circulation is not needed so much. That is pretty well recognized, as the gentleman says. The problem is not so much in heating up the wire and getting it uniform. The problem is in cooling, when you get down to a black heat. Then your cooling is very slow and that is why you have to have so many pots, eight or ten pots, if you are going to depend on natural cooling.

MEMBER: Why do you have to depend on natural cooling? Couldn't you make another unit, the same as your heating unit, and it would be a refrigeration unit — put the bell in that?

CHAIRMAN SCHMID: He asks, and it is a good question, could you have a refrigeration cabinet that would be like the furnace? You take your pot or bell out of the furnace, put it into the refrigeration capsule.

MR. MICHAEL: It would not be good for the copper, you see, because experience shows that when you cool down your copper too quickly the structure changes. That is not good. You should allow a certain time for cooling it down, and this is very important.

When we speed up the cooling-down time by 30 or 35 percent, with that special cooling device, then that is just the limit. You must never overdo the cooling-down period.

MEMBER: What problems might be presented in a vacuum annealing of nickel and nickel-base alloys?

CHAIRMAN SCHMID: I would like to make a few comments at this point. This is not a paper, so bear with me, but Mr. Michael has said that his furnaces are more for the copper and the lower temperatures. He goes up into the high temperatures, too, but there is another furnace perfected by Dr. Werner Herticeroff which covers that range. I have a model of his furnace. He couldn't come over — I wanted him to come over, too, but he couldn't and he asked me to give a little description of his furnace and tell you something about these nickel alloys. So if there are no other questions here for Mr. Michael, I will answer Fritz's questions, and perhaps some of these others.

I am glad to see that there is some interest here in this type of furnace that I am going to talk about.

At Techalloy we have been doing some experimental work on vacuum annealing for several years and after reading up on work done in this country and also that in Germany, we felt that perhaps the Germans were ahead of us in some phases of vacuum annealing, so Ralph Cubbler and myself went to Germany last month on a quick trip to spend a week of learning about German Vacuum Annealing Furnaces. We were most favorably impressed and especially with the number of installations and the widespread use of vacuum annealing for the mass produced metals like copper and steel wire along with Stainless Steels, Nickel Chromium and other Nickel Alloys.

During our German visit we inspected a number of the Fritz annealing furnaces in operation and talked with their owners who are most pleased and recommended them most highly. The operating costs were low and the quality of the work excellent.

Since for many of our alloys that we have to operate at 2,000 degrees F. high-vacuum annealing in conventional furnaces presented some natural limitations because the inner covers or pots have to be of such excessive thickness such as ¼" to ½" depending on the size of the pot due to the external pressure of one atmosphere of 15 pounds per square inch. In the conventional pot this atmospheric pressure exists between the inner part of the furnace and the outer part of the pot or inner cover. Even when made out of heat resisting Inconel or Incoloy the conventional type of annealing furnace pot or inner cover will show gradual fatigue. When new the pots possess considerable resiliance which is fully lost as the grain size of the metal becomes increased and oxidation occurs on the outside with the natural migration of the alloying elements. A small dent will occur in handling and after each annealing operation becomes larger until the whole cylinder is deformed.

The thick pot or inner cover wall that are required to stand the high temperatures and pressures require excessive heating up and cooling time.

The disadvantages that we have just discussed for the conventional vacuum annealing furnaces we think can be corrected with this newer type of furnace where vacuum is also pulled on that space between the furnace and the inner cover. Some people refer to these as high vacuum annealing and pressure relieved pots. Here the pot and furnace are simultaneously evacuated. The pot or inner cover or muffle remains completely pressure relieved during the whole annealing process. This means that complete freedom has been developed in respect to the annealing pot shape, their sizes and required annealing temperatures.

The furnace we are discussing for the time being is only manufactured electrically heated and has a vacuum tight outer casing or shell. The top of the annealing pot or inner cover consists of a square section water cooled pipe so as to keep this part cool and prevent distortion that would take place if it were allowed to heat up. This water cooled square section provides the vacuum tight seal by means of a rubber gasket. The furnace is sealed in a similar manner.

The model of a pot type vacuum annealing furnace is available here for your inspection after the meeting and we purposely put it in the middle here so you can all get around it and I'll gladly answer questions.

The general operating practices in Germany for these furnaces are to have 4 to 8 pots or inner covers depending on your operating temperatures plus the heating up time and the cooling off time. For example, in our alloys where we are operating at 2,000 degrees F. we figure we will probably need as many as 8 pot or inner covers. Before inserting in the furnace a vacuum is pulled on the loaded inner pots and a good vacuum type valve will maintain this seal for as long as ½ hour if necessary. The metal going into the furnace should be dry and clean. After inserting the pot or inner cover in the furnace a vacuum is pulled on that section between the pot and the inner part of the furnace by means of a mechanical rotating piston pump and this same pump can be used to pull the vacuum on both the inner pot and the furnace section down to about 50 microns or .050 mm. 1 micron equals .001 mm. While this mechanical pump will pull a little lower than 50 microns the normal practice is to then add the oil diffusion addition and all this consists of a heated oil reservoir so that these oil vapors will provide a volume of several square feet to trap the stray molecules of air that are being pulled through this oil vapor trap by the mechanical pump which has now been switched to where it is pulling the few remaining molecules of air through the oil diffusion trap, while this oil diffusion trap or pump part of the pumping system has no moving parts, it does require some fussing with and control. For example, the upper part of this oil trap must be refrigerated and have refrigerated baffles in it so that the oil vapors will not rise into this section for the danger or fear that they will pass into the furnace chamber to which they are directly connected and of course the pot chamber. Actually when the oil diffusion pump is put into operation at the 50 micron the valve is sealed on that section between the furnace and the inner cover. For this section of the furnace 50 microns vacuum is quite adequate. The oil diffusion trap pump system is only required for the pot or inner cover where the work is being heat treated or processed.

Here is a very important point to make when you are building your vacuum annealing furnace to make your outlet pipe quite large and for example on this model that we don't think the pipe is large enough and on our furnace we are going to make a 6" diameter outlet pipe so as to get the few remaining stray molecules of air out more quickly. Actually these few remaining stray molecules of air are most difficult to extract and a lot is based on their just happening to hit the outlet on their bouncing around inside the pot. So therefore the bigger the outlet the better your chances are that they will hit it during their wandering.

Now that we are on this pumping system it will be interesting for you to know that to bright vacuum anneal Stainless Steels .1 micron or .0001 mm of vacuum is required to do a good job. You can better understand now why the metal going in must be dry and clean so that it will not foul up your mechanical pumping system as well as your vacuum oil diffusion pump trap.

Then after the heating cycle has been completed the vacuum type valve is sealed, the pump shut off and the inner cover removed from the furnace. After it gets to its cooling position the vacuum pump is again hooked on and vacuum is continued to be pulled until the load gets down to two hundred or three hundred degrees F. where it can be shut off and exposed to the atmosphere without discoloration.

On some alloys and in some plants where they are doing Stainless Steels after the heating up and required soak time and before lifting the pot out of the furnace both pot and furnace are flooded with air or inert gas. The flooding of the pot consists of a gas cylinder, a preflooding apparatus and the flooding which is attached to the vacuum tight shut off valve on the lid. The pre-flooding apparatus is a vessel with built in racks containing silicon jell to dry the passing gas of all traces of moisture. A low pressure gauge is used to maintain the apparatus at a pressure of 2 to 10 pounds per square inch.

The furnace part is flooded with air.

Most experience shows that the brightest surface, if flooding is required, is obtained by flooding with argon. Argon is extensively used in Germany for flooding the pots in the cooling off period. Hydrogen is used somewhat but safety precautions limit its use since it is obviously necessary after cooling

of the flooding hydrogen to evacuate this before entering the air. This also applies when using cracked ammonia. Nitrogen can be used in a lesser degree but experience shows that the surface will exhibit a dull haze.

We don't plan to use flooding in our furnace because our investigation shows that it does not cut down the cooling time enough to justify its high cost.

One of the most surprising plant installations we visited in Germany was Stainless Steel and Nickel Chromium Alloy wire plant in Dusseldorf. We found them vacuum annealing and descaling at the same time, ¼" diameter hot rolled rods. Here is a sample of the rods before going into the furnace and after the furnace treatment. We also found them vacuum annealing on all of the intermediate anneals and again we have a sample of the wire before and after vacuum annealing on the intermediate breakdown anneal. All of this annealing was done at 1950 degrees F. I know that you Stainless Steel wire drawers are thinking how can they prevent carbide precipitation during this slow cooling operation; well, the answer is, obviously, that they don't, but they eliminate the carbide precipitation in the last anneal by making that a conventional bright cracked ammonia or hydrogen strad anneal so that they get a fast quench and hold the carbon in solution. In looking over the analysis of their 18-8 Stainless Steels that they were annealing, I noticed most of the carbon around .04 or .05 and they keep their carbon on the low side. Another practice that some of them use is to anneal at 1650 degrees F. where they get a different type of carbide precipitation that is not as objectionable because in this type of anneal the metal is never up to the 2000 degrees F. where they get all of the carbon into solution and therefore during the slow cooling operation there is not as much carbon precipitated in the grain boundaries. How practical this practice is I don't know. We are investigating this in our research laboratory now, but all of the metalography work is not complete.

At Techalloy we are real optimistic about the increasing number of applications that we feel will develop for vacuum annealing. Should any of you have metal that you want experimentally vacuumed annealed, or if we can help you in any way to investigate vacuum annealing, we will welcome the opportunity. We think that vacuum annealing merits more investigation.

While the quality of some of the American systems for vacuum annealing that we have seen is outstanding and perhaps better than some of the German systems, we do definitely know that the Germans are ahead of us in the number of vacuum annealing furnace installations and a greater variety of applications they have made of vacuum annealing. We think it is time the wire industry investigated vacuum annealing most thoroughly and we will be glad to make our coptribution to help any of you. For example, in annealing where the purpose is to get a bright finish, expensive atmosphere generators and crackers can be eliminated along with the expense of the gas or atmosphere going into the generator or cracker. Vacuum pumps are far less expensive than generators and crackers.

CHAIRMAN SCHMID: Now, while we have the slide on, are there any questions? Please stand up if you have a question on something that we can better describe while this slide is on. Well, lights, please.

For the high nickel alloys and super alloys, Inconel, B and C, these vacuum furnaces have a big advantage in that you can bring the work out brighter and cleaner. You don't get the oxidized abrasive compounds. titanium nitrates and that sort of thing, on the surface which can be troublesome in drawing.

We feel that there is a growing number of applications for this vacuum annealing furnace. We haven't decided whether the pit type or the elevated furnace is of the most advantage for our type of high temperature work. We probably will have one or the other in operation sometime toward the end of the first quarter, and after some experimenting and trials, and some metallography work on the results of those trial runs, we will be most happy and willing to pass on any information to you.

If any of you have experimental lots of metals that you would like us to vacuum anneal, we will be very happy to do it.

We will be happy to show you the furnace, too, when we get it in operation.

Ralph Cooper, my partner, and I are both good disciples of vacuum annealing and we are happy to spread the gospel.

Now I will take a couple of minutes here on this model.

There is something I did see over there in a stainless steel wire plant that might be interesting to you. In this plant near Dusseldorf they were making stainless steel, also nickel chromium electrical resistant alloys, taking quarter-inch hot rolled rods and vacuum annealing those, and also using it as a descaling device — because in the temperature change, and also the fact that they were using vacuum, the scale would pop off. They were eliminating their pickling. Their subsequent intermediate anneals they were also doing in vacuum. We have some samples of those rods up here which you can come up and take a look at. You stainless steel wire drawers will be interested in this. They were vacuum annealing Type 304 stainless. Most of their heats were low in carbon, around .04 or .05.

Of course, in this type of procedure you are not able to give it the fast quench which you normally associate with stainless steels, to eliminate the carbide precipitation. So your question probably is: What were they doing with this carbide precipitation? They were permitting that to exist in the intermediate anneal, and then in the final anneal they would do the conventional bright hydrogen strand anneal and in that way put all the carbon back in solution, get rid of the carbide precipitation that they had introduced in the vacuum intermediate anneals.

They were annealing some stainless at 1650° F. They claim that they don't throw all their carbon into solution at 1650° F. They get less carbide precipitation. I don't think much of that has been done in this country.

We brought some samples of that back, but we haven't completed our metallography work on it so I can't tell you much about that. I just wanted to throw this in to let you know what they are doing over there even with the stainless steels.

MEMBER: How high a temperature have you reached in those?

CHAIRMAN SCHMID: This furnace will regularly operate at 2,000 degrees. I saw a furnace in Dusseldorf just like this, operating 2,000 degrees on stainless steel.

MEMBER: Do they go up to 2200 or 2450?

CHAIRMAN SCHMID: I would say because of the electric heating elements it would be awfully hard on the electric heating. With 80 nickel-20 chrome, if you go over 2,000, 2,050, you get into short life.

MEMBER: What is your maximum cooling time?

CHAIRMAN SCHMID: Well, you can take as long as you like — and it is always too long.

MEMBER: I meant your deceleration.

CHAIRMAN SCHMID: Well, you go down to a thousand — black heat — very quickly, but then after that it is real slow.

MEMBER: By "very quickly" you mean what, ten minutes?

CHAIRMAN SCHMID: No, I would say probably an hour. Maybe a little less than that.

There is one other phase of vacuum annealing that I would like you to know about. The Electric Furnace Company in Salem, Ohio, are developing a continuous vacuum annealing furnace. That is needed, is something very urgently needed by the stainless steel industry, to be able to strand vacuum anneal and get this fast quench that is required. It is needed by other metals also, not only wire but strip.

We are fortunate this morning to have R. J. Perrine here, of the Electric Furnace Company, Salem, Ohio, to give us a five-minute resume about what they are doing on that.

MR. PERRINE: I would like to comment on one phase of Mr. Michael's presentation. Somebody asked, how were the physical properties improved with vacuum annealing and, of course, if you have copper that isn't oxygen-free and susceptible to hydrogen embrittlement, vacuum annealing is the answer.

I can't quite parallel his results with sticking. We have had some experience in annealing copper coils, strip, in vacuum and we could find no difference between the sticking properties with an atmosphere and in vacuum. I think that sticking is probably related to three or four functions. One is the temperature at which you are annealing; two, the pressure under which the coil or strands of wire are wound; three, the surface finish and, of course, four, the lubricant.

We have developed a continuous vacuum furnace which is conventional in form; a heating chamber approximately five feet long, and a cooling chamber about five times the length of the heating chamber.

The seals are mercury. There is a mercury reservoir at each end of the furnace at a lower level, approximately 30 inches, so that when the vacuum is pulled the reservoir then supplies the leg, which is approximately a 30-inch column.

The furnace is a cold shell. The lining is a conventional refractory of high purity quality. I know the vacuum people would shudder to think of evacuating a furnace which is refractory lined. It isn't too bad under certain conditions. Starting up from cold, when the atmospheric moisture is allowed to enter the furnace, it might require an evacuating period of two days. If you happen to break the strand or strip and have to rethread, we have pumped it down below 10 microns in an hour after rethreading.

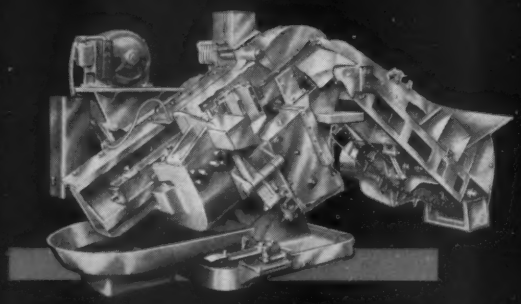
Some of the advantages of annealing in a vacuum atmosphere are:

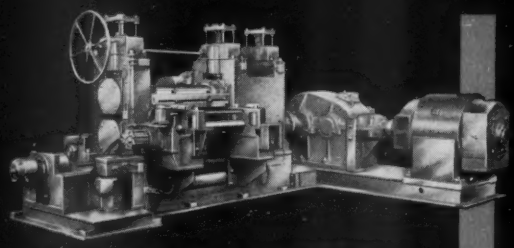
There is no nitrogen pickup. That is really detrimental in the thinner guages, and some of the precipitating hardening alloys. We have saturated some of these alloys with nitrogen and found that in the atmosphere they would pick up as high as one and a quarter to one and a half percent of nitrogen. This isn't possible in vacuum annealing.

One of the other great advantages is that there is no explosion hazard. It is an atmosphere that you don't have to worry about purging the furnace and depurging. Once

(*Please turn to page* 122)

COLD HEADING
MACHINERY





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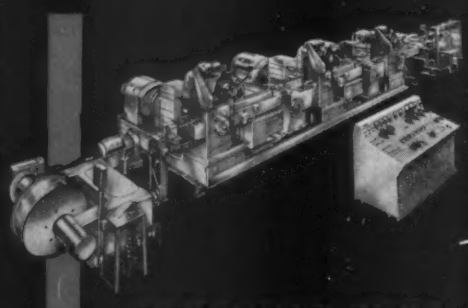

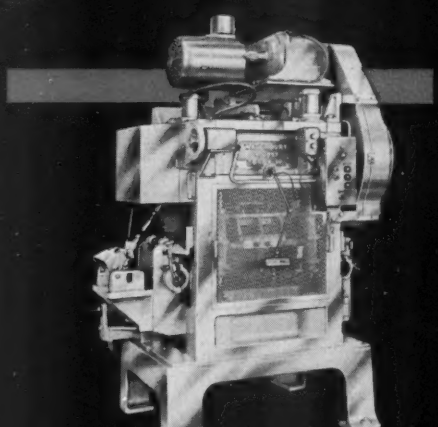

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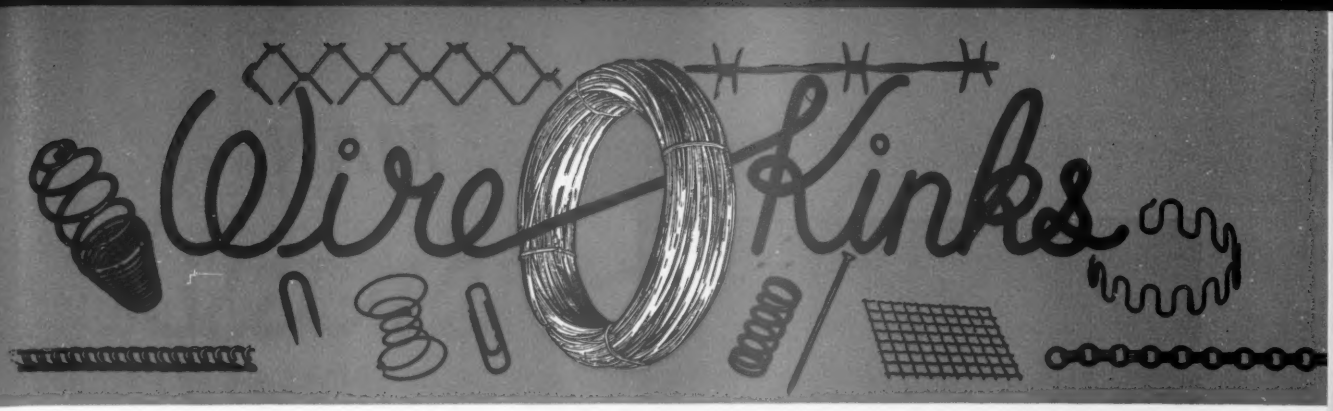


In this department will be published helpful hints on how to do things and the questions asked by our readers on wire processing problems, together with the answers and comments thereon received from the field. In no instance will the identity of the persons asking for advice or of those supplying it be published.

Our readers are invited to send helpful contributions and to submit questions on their technical problems to the Editor. These will be answered from information on hand or from the field, when it becomes necessary to secure counsel from that source.

High Tensile Wire and Strand for Prestressed Concrete Use

Question

We have studied ASTM Standard covering concrete strand and would appreciate clarification of certain aspects of this specification, as follows:

a) Stress Relieving — Section 6
Details regarding low temperature heat treatment, such as temperature and heating time are desired.

b) Slip Limiting Grips — Section 8
Under the heading "Tension Test", it is stated that "the ends shall be secured in the tensile machine by the use of fitted slip limiting grips or other suitable methods of anchorage". What are slip limiting grips and what would be considered other suitable methods of anchorage?

c) Extensometer —
Sections 10 and 11
Reference is made to the use of extensiometers to determine the yield strength and elongation of the strand. What type of extensometer is used for these tests?

Answers

Reply No. 1

In answer to your letfer of October 2 your reader should know that stress relieving of strand is done in several different ways; for instance, in lead, heated air, or induction heating. In each case the time and temperature have to be adjusted to the characteristics of the particular equipment.

* * *

The official proceedings of the First U. S. Conference on Prestressed Concrete held at M.I.T. on August 14 through 16, 1951 contains a paper given by Mr. H. J. Godfrey of Roebling on the subject of "Steel Wire for Prestressed Concrete". In this paper Mr. Godfrey describes several practices and the effect on the mechanical properties of the wire. Briefly the time and time temperatures which he studied are as follows:

750° for 20 seconds
750° for 40 seconds
750° for 30 minutes

* * *

The actual temperature reached by the wire, as stress relieving is practiced today, will be very close to the 20 — 40 seconds treatment referred to by Mr. Godfrey.

Reply No. 2

Please refer to your letter of September 25, 1959, regarding the procedure for stress-relieving strand for **prestressed concrete.** Laclede Steel Company is presently having its strand for prestressed concrete stranded and stress-relieved at the Leschen Wire Rope Div. At Leschen, the strand is stress-relieved in a high velocity gas furnace of the type described on Page 95 of the February, 1958 issue of "Iron and Steel Engineer". The strand is heated to approximately 700°F by radiation and convection in a 50 foot furnace controlled at 875°F. Automatic controls lower the furnace temperature if for any reason the strand stops in the furnace.

Speed and Heating Time of Strand

Size		Speed	Heating Time
7/16"	29	Ft./Min.	103 Seconds
3/8 "	31	Ft./Min.	96 Seconds
5/16"	40	Ft./Min.	75 Seconds

If the strand is under stress-relieved, the yield point will be in specification but the total elongation as required by ASTM will not be met. If over stress-relieved, the yield point and tensile strength will both be below specificatioh. I am sure that additional details on the furnace and its operation could be obtained by contacting the Leschen operating personnel.

Reply No. 3

This is in reply to your letter to the ASTM requesting information to that given in Specification A416.

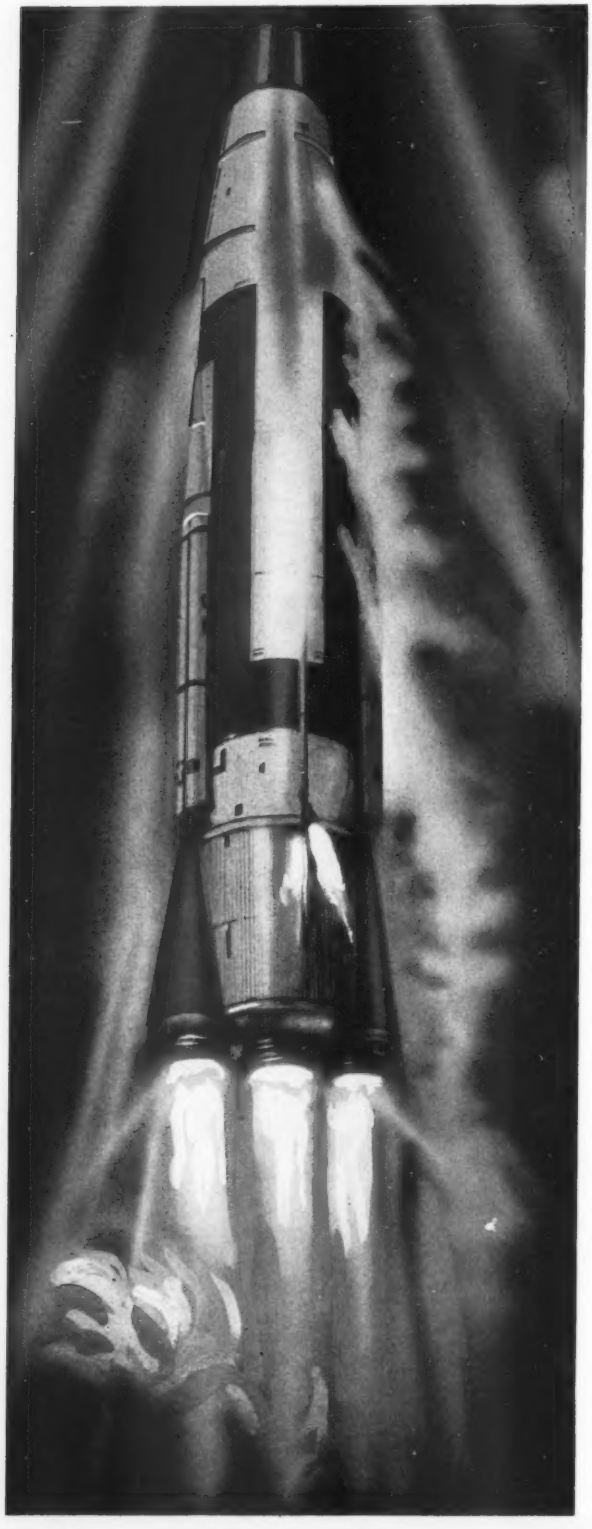
* * *

Regarding your question (a) Stress Relieving — Section 6, we have no information on details of low temperature heat treatment. This could probably best be obtained from a producer such as American Steel and Wire or Roebling.

* * *

The use of slip limiting grips mentioned in your question (b) was developed by American Steel and Wire Company and is in general usage to insure that the strands will break outside the grips. More details on this can be obtained from AS&W, but briefly the test method consists of first tinning the ends of the strands over the length within the grips with a babbit metal until a thickness of ⅛ to ¼ in. has been built up. The ends of the strands are then placed in test machine between wedge grips. The use of this soft metal coating prevents the wedge grips from cutting into the strand wires to cause a premature failure within the grips. I understand that the ASTM is planning to include this method as a stand-

The Wire Machinery **MAN...**



"FAVORS COST-REDUCTION WITHOUT LARGE INVESTMENT"

The Steel Industry has just gone through a 115 day strike. What was the underlying reason . . . .

Wages	Fringe Benefits
Prices	Imported Steel Products
Work Rules	

Increased production with less labor costs is needed to combat most of the industry's problems.

Big question puzzling management is where and how to cut-costs without large capital investments.

Industry and unions have both been hurt during the strike and nobody wants another round like that. Increased production with less labor costs may well be the real answer industry is seeking today.

You must increase production . . .

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Greatly reduced floor space requirements. Extra large packages for in-process wire.

Large coil - up to 5,000 pounds. Exceptional versatility for inter-plant transportation.

Producion efficiency approaches 100% on continuous basis. 25% increase in production.

Design simplicity means negligible maintenance.

NEW!! WHITACRE ANNOUNCES:

New water-cooled die and block available.

New capacity up to 5/16".

You pay for a Dead Block each day you operate so check your plant against our reasoning and statements.

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Wire Machinery Inc.

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POrtsmouth 7-2508

Wire Kinks

ard test of strands.

* * *

The use of extensometers as indicated in your third question has to date been developed by individual laboratories. I know of no commercial instrument on the market. The common type consists of two clamps which grip the strand to provide the necessary gage length. An Ames dial is used to measure the elongation. If the elongation at ultimate load is needed a machinist's scale can be used.

* * *

The Portland Cement Association has used these slip limiting grips and the extensometers mentioned above. I am sure, too, that the AS&W could give you information on their success with these."

Performance of Enameled Wire at Sub-Zero Temperatures

Question

We would like to know whether there are any reports published on the performance of enameled wire at sub-zero temperatures down to -40°C. This information is wanted in connection with the use of magnet wire in motors for freezing plants.

Answer

I do not know of any published work on the effects of low temperatures on enameled magnet wires. It is our practice to put a case of any new wire in a cold box and let it stay there for a few days at -65°C. So far, nothing we have put on the market has been damaged by this condition.

* * *

Also, we have at times sold small magnet wires to experimenters who made very small thermocouples with them and then used these at low temperatures. Apparently, the enamels have not been badly damaged by such use. So, I conclude that the effects at -40°C on commercial magnet wires are slight.

* * *

It might also interest you to know that we probably get one inquiry like this every five years, and I think this explains why very little work has been done at these low temperatures. Our only reason for doing the work that we mentioned in the first part of this letter is to make sure that magnet wires can withstand any possible freezing they might get in shipment.

Thread Rolling

Thread rolling is not new. A device was patented in 1867, but was too advanced for the times and it came to naught. It was about 1900 when thread rolling came into general use, and since that time great improvements in materials, designs, and in production rates have come about.

* * *

Planetary thread rolling, the modern method, is, of course, a cold forging process. A machine requires a hopper holding a sufficient quantity of blanks to meet its production capacity, great rigidity of construction and accurate rotary and stationary dies of long life characteristics.

* * *

Theoretically, it is possible to feed a blank at every pitch circumference on the rotary die. This would mean that for every revolution 55 blanks would feed in on each side. With a spindle turning at 52 RPM a total of 343,200 threaded parts per hour would be produced, which emphasizes the need for an adequate supply hopper.

* * *

Because of the accuracy and greater strength of bolts on which threads have been rolled, and also the low cost of the method, the great bulk of threaded products are produced by rolling.

Catalysts and Wire Enameling Effluents

As enameled wire passes through a drying oven, the solvents and other ingredients are vaporized, leaving a baked film on the wire. This effluent leaving the exit end of the oven is collected by a hood provided with a mechanical exhaust, which blows it out into the atmosphere through a stack.

* * *

The stack effluent contains the products of combustion: water vapor, organic solvents, aldehydes, phenols, and other particulate matter, mostly the resin base of the enamel. These fumes cause an objectionable contamination of the atmosphere in the neighborhood of the plant that has given rise to ordinances and laws prohibiting their formation.

* * *

For a number of years this condition has been overcome by many plants through the installation of catalysts that consume the oven effluents and convert them in the stack to innocuous, non-objectionable vapors. Catalytic combustion is based on the use of a catalyst, which while not changing itself, by its presence induces a temperature rise sufficient to oxidize or incinerate the effluent materials,

(Please turn to page 130)

National Electrical Manufacturers Association Presents Reorganization Plan at Convention

A significant and momentous change in the organization and functioning of the society has been proposed and is expected shortly to become effective.

At its 33rd annual convention in Atlantic City, N. J., on November 11, 1959, plans for the reorganization of the National Electrical Manufacturers Association were presented to the members in attendance and approved by voice vote. This is to be followed by a poll of the entire membership by letter ballot, which, if favorable, will put the plan into immediate effect.

* * *

NEMA has had 65 product sections and a total of 95 sub-divisions. Since many of these sections had no direct representation on the Board of Governors, nor had all of the governors a working acquaintance with all of the sections, some of the sections had felt that they had little or no voice in the formulation of the policies under which they functioned.

* * *

Under the reorganization plan all sections have been grouped into eight divisions, each represented by at least one member on the Board of Governors. In the new plan each division will have its own Board of Directors and will conduct its affairs semi-autonomously. The tie-in with the Board of Governors, in which body is vested the top management of the Association, will be, as stated above, through representation on the governing body by a member from each section. The Board of Governors also has been reduced in size from a maximum of 44 members to a maximum of 34 members for greater efficiency.

* * *

In the discussion following the presentation of the new set-up, a quesiton was asked as to whether a section that had been placed in one division could be transferred to another division if it appeared that the section had been improperly assigned. The answer was that such shifts could be made or a new division created, if one or the other of these steps appeared to be the solution to the problem.

* * *

Under the reorganization, the old **Wire and Cable Section** is to be designed as the **Wire and Cable Division,** with eight sections, as follows:

Armored Cable
Magnet Wire
Paper Power Cable
Building Wire & Cable
Rubber, Thermoplastic & Varnished Cambric Cable
High Temperature Insulated Wire
Flexible Cords

* * *

New officers elected were: **N. J. MacDonald,** President of The Thomas Betts Co., President; W. C. Wichman, Vice President of General Electric Company's Hotpoint Division, Vice President; and **A. D. R. Fraser,** President of Rome Cable Division of Aluminum Company of America, Treasurer. Mr. Wichman headed the Planning Committee that had drafted the sweeping organizational changes.

* * *

In the Wire and Cable Section the following men were elected for the coming year: Chairman— **David E. Allen,** Vice Pres., Anaconda Wire & Cable Co.; Vice Chairmen — **Vernon E. Heimberger,** Manager — Electric Product Sales, American Steel & Wire Div., United States Steel Corp; and **H. W. Clough,** Vice Pres. of Belden Manufacturing Co. **Mr.** Allen was also elected to the Board of Governors and **C. W. Higbee,** Asst. General Manager of the Electric Conductor Div., Kaiser Aluminum & Chemical Corp., was re-elected to the Board to serve for a three-year term. The Wire and Cable Division's membership is comprised of companies producing electric wire and cable.

* * *

During the convention the Wire and Cable Section held its customary separate sessions, during which plans were initiated to promote the safe handling of wire and cable in transit and to produce technical handbooks on wire and cable products. The Section conducted a 3-day conference on industry and economic problems.

* * *

Joseph L. Singleton, Senior Vice President of Allis-Chalmers Manufacturing Company, the retiring NEMA president, presented the annual report, reviewing the history of NEMA'S development, its work over the years in formulating thousands of standards, and the need for the proposed reorganization.

* * *

Dr. Pierre A. Rinfret, Vice President and Director of the Economics Department of Lionel D. Edie & Company, addressed the group at a dinner meeting, in which he spoke of the "dynamic growth" of the country and stated that "change is the keynote of the sixties." He listed as the ten top-growth industries in the next decade: electric utilities, consumer boats, foreign travel, missiles, electronics, office equipment, housing, aluminum, plastics and drugs. He felt that the economy would be more vulnerable to fluctuations in the next ten years, but that the long-term growth of the United States is excellent. He forecast an average gain of 3½ percent a year in volume during the sixties.

* * *

The reorganization is designed to gear the society the better to cope with the anticipated "fabulous new era of expansion for the electrical industry" putting into effect a plan of operation that its sponsors hope will merge the efficiencies of corporate management with top-flight trade association practices.

G. E. Reveals Process of Making Diamonds

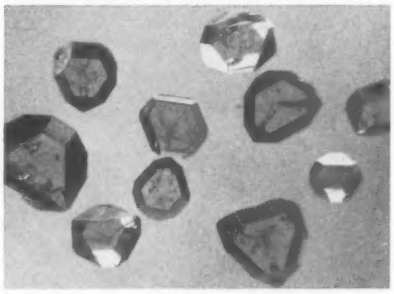
The General Electric Research Laboratory has revealed the details of one of its major scientific and engineering achievements, the process for making diamonds. Man-made diamonds, the climax of a 125-year effort to duplicate nature's hardest substance, were first announced by the Laboratory in 1955.

* * *

Of proper size for many industrial uses — less than a tenth of a carat — these diamonds are manufactured at **General Electric's Metallurgical Products Department** in Detroit, and have been sold in commercial quantities since October, 1957. Until recently the unique process has been covered by a U. S. Government secrecy order.

* * *

The break-through that enabled General Electric scientists to transform carbon into diamonds was the use of a molten metal catalyst which acted as a thin film between the carbon and the growing diamond crystal. The molten catalytic film and the development of new superpressure and high-temperature apparatus made possible the long-sought transformation from carbon to diamond, without which, pressures of three million pounds per square inch and



Photomicrograph of Synthetic diamonds

temperatures of over 7000°F would be required to transform carbon into diamond. No equipment exists that could produce such a combination of sustained pressure and temperature.

In the new system carbon and a catalyst metal are placed in a pressure cell and are subjected simultaneously to pressures ranging from 800,000 to 1,800,000 pounds per square inch and temperatures ranging from 2200°F to 4400°F. The form of carbon has an effect on the kind and number of the diamonds formed. Best results are obtained with pure graphite. Other materials, such as carbon black, sugar charcoal, or carburizing compound, may be used, but graphite is preferred.

* * *

The catalyst metal can be chromium, manganese, iron, cobalt, nickel, ruthenium, rhodium, palladium, osmium, iridium, or platinum. Tantalum is particularly effective for inducing the growth of small diamond crystals, although under some circumstances it may not be as active as the other catalysts. Diamonds can grow at rapid rates and their formation (80 mesh and finer) is completed within a few minutes.

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WHEELS AND MACHINES FOR BEST WIRE IDENTIFICATION

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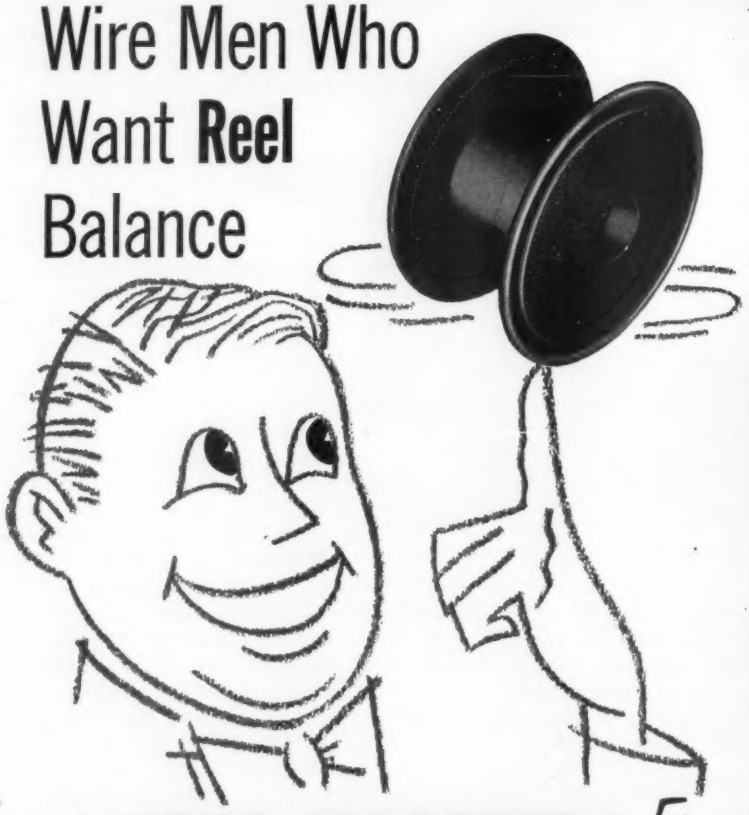

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Apco's precision all-steel construction assures smooth spool-out without wire breakage or trapping . . . keeps machine downtime to the minimum . . . keeps your production rate up to date. What's more, you get a strong, safe, wire-processing package that pays off in substantial on-the-line economies.

Wire, write or phone collect for preliminary recommendations. If it's reel balance you want, Apco Mossberg has the answer that makes real sense.

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Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS

The making of diamonds is significant as the first major achievement in the commercialization of a superpressure process. It has also removed the possibility of the exhaustion of the world's diamond supply and, unexpectedly, has shown that man-made diamonds surpass natural diamonds for various industrial uses.

Gas Welding Rods

Gas Welding Rods, a comprehensive and well-documented 8-page bulletin, DH-1277-B, has been released by the **Page Steel & Wire Division,** American Chain & Cable Company, Inc., Monessen, Pa. These rods meet the requirements for fabricating ferrous metals and are produced to weld practically all metals of this class.

* * *

The booklet gives complete information about each of the manufacturer's Gas Welding Rods, analysis of the rod, recommended uses, welding procedure, and physical properties. Information and data are also presented regarding the oxy-acetylene flame, torch tip sizes, pipe welding, weights of rods and weld metal deposits, and factors involved in estimating costs of gas welding.

New Metalworking Directory

Dun and Bradstreet has issued a new reference book, the 1960 Metalworking Directory, in which over 31,000 metalworking and metal producing plants are listed geographically, by line of business, and alphabetically.

* * *

The data includes addresses; names of management, production and purchasing personnel; principal products made; number of employees; and other pertinent information. All information is contained in one volume and is considered the most complete sales and market guide ever compiled on the metalworking industry.

* * *

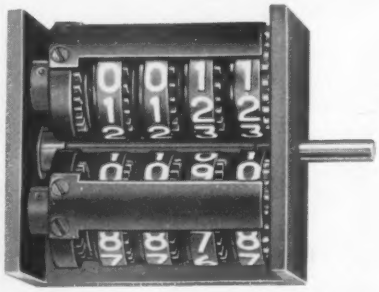
In order to meet the requirements of companies selling in smaller areas, regional editions are available. The complete volume sells for $350.00, and may be ordered from Dun and Bradstreet, Inc., 99 Church St., New York 8, N. Y.

Dual Bank Counter Added to Durant Line

Durant Manufacturing Company has announced a new line of instrument counters for use in navigation and tracking equipment, machine tools and all digital readout equipment where plus and minus readings are needed. The Model-Y Dual Bank Counters are a new part of the large Durant family of high speed counters used in the instrumentation field.

* * *

The shutters of the new group of counters are arranged to give plus and minus, or north and south readings. Long life, high speed instruments, the Dual Bank



Model—Y Dual Bank Counters * * * * * *

counters are built with nylon wheels and pinions to reduce torque and give lower moment of inertia, higher speed and longer life.

* * *

A highly versatile instrument, the Durant Dual Bank Counter is available in right hand drive, left hand drive, clockwise or anti-clockwise rotation and with three, four or five digits. One revolution of the shaft is equal to one revolution of the first wheel, or ten counts to one revolution of the shaft. The lightweight, sturdy frame is of aluminum in instrument black finish. The unit is capable of operating over a range of from a minus 55 degrees Centigrade to 75 degrees Centigrade.

* * *

Complete information may be obtained by writing the Durant Manufacturing Company, 1918 North Buffum Street, Milwaukee 1, Wis.

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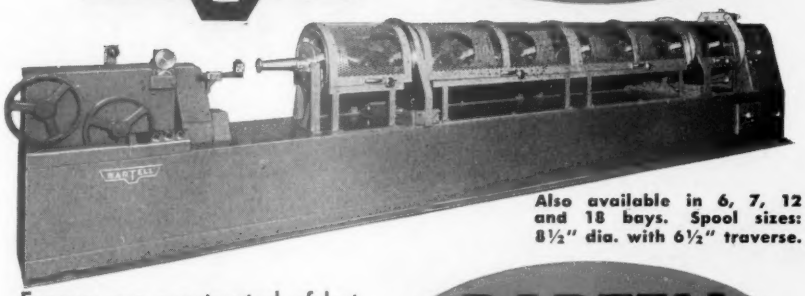
FOR THE BEST



Also available in 6, 7, 12 and 18 bays. Spool sizes: 8½" dia. with 6½" traverse.

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MODEL 7B-58-15

Frames are constructed of hot rolled shapes and plates to form a rigid box structure. Barrel is extruded 6062T-6 aluminum — Smooth starts through slip clutch driven by 7½ H.P. motor — Operators control station at front of machine — Main power control center at drive end — Electronically controlled automatic stop energizes solenoid operated brakes in event of wire breakage — Spool cradles and associated parts are completely interchangeable from one machine to another — Tungsten carbide wire guides throughout — Lay from ¼ in. to 5 in. long.

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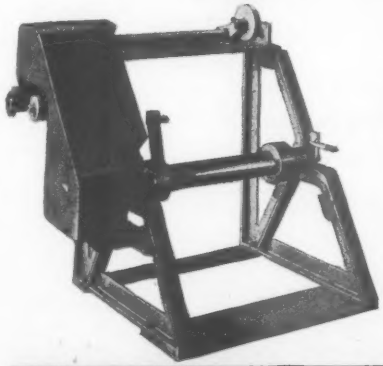
BARTELL TAKE-UP



This Take-Up is belt-driven, the drive originating from a slip clutch located outside the capstan box. Electrically operated traverse adjustable from zero to maximum reel width. Accommodates reels up to 30" dia. Speed selector sheave adjusts lay on reel to suit diameter of finished strand.

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS

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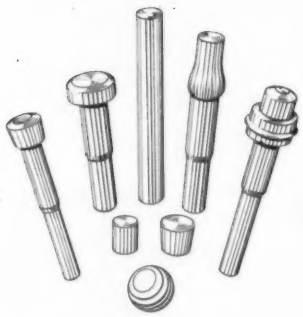
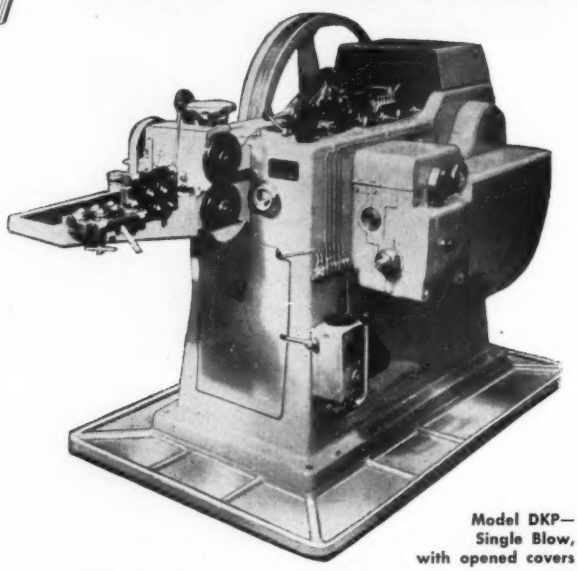


Single and Double Blow COLD HEADERS

UP TO **350** PCS. PER MIN.



Model DKP—Single Blow, with opened covers

These famous German machines feature:

- ★ CAPACITIES—3/16" to 1" dia. wire stock: Short Stroke—1" to 4-15/16" shaft length; Long Stroke— 1¾" to 8"
- ★ Fitted with solid or open dies
- ★ QUICKLY ADJUSTABLE PUNCH SHIFTING SLIDE—has double locking mechanism
- ★ WEAR PLATES ARE ADJUSTABLE nitraded steel
- ★ ONE SHOT LUBRICATING SYSTEM—to all parts of machine
- ★ Special types of Cold Headers for the production of balls, cylindrical and taper rollers and cold forged components
- ★ A complete range of auxiliary equipment such as re-heading machines, trimmers, pointers, slotters and thread rollers are available

Write or Phone ED 1-4858 for details!

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Grace Announces Availability of High Density Polyethylenes

The Electrical Polymer Department of Polymer Chemicals Division, **W. R. Grace & Co.,** has announced the availability of a wide range of Grex high density polyethylene copolymer compounds for electrical applications in jacketing, sheathing, and as primary insulation. The available grades include general solid, insulation types in natural, black, and colors; flame retardant types; foam grades; and cross link grades. These materials are compounded to the specific needs of the cable engineer and include formulations based on a 0.95 density copolymer resin in melt indices of 0.29 or lower. Grex compounds are produced from special selected lots of resins that meet precise quality specifications for the maintenance of high physical, electrical, and chemical properties.

* * *

Unlike former high density polyethylene resins of 0.96 density, these copolymers exhibit exceptional thermal aging characteristics and highly improved stress crack resistance.

* * *

For a data sheet designed to assist users in the selection of the right grade of Grex copolymers, write to W. R. Grace & Co., Clifton, N. J.

New Verti-Slide Machine Described in Bulletin

Detailed operating features and specifications for the new V-81 Verti-Slide vertical four-slide machine are given in a 6-page technical bulletin just published by **The Torrington Manufacturing Company.** Machine components which are described fully include the unique cam timing disc, center form, slide feed assembly, toggle-type press, and forming slides. Specifications cover machine capacity, drives, slide strokes, press, feed (90° and 180°) and other information required in evaluating application of the V-81 machine.

* * *

A copy of Verti-Slide Bulletin V-81 may be obtained by writing

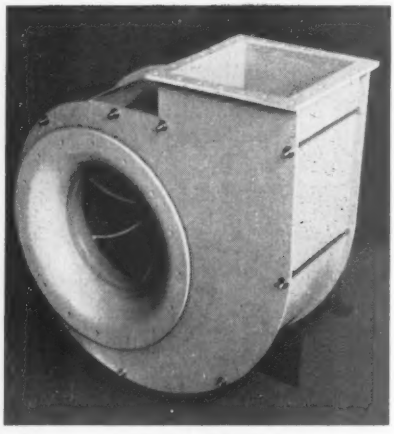
Machine Division, The Torrington Manufacturing Company, Torrington, Conn.

New Solid Plastic Fan For Corrosive Fumes

The photo illustrates a Heil Rigivin (P.V.C.) No. 20 Solid Plastic Fan supplied to a large midwestern chemical company to exhaust extremely corrosive and poisonous fumes.

* * *

All parts of the Heil Rigivin Fan coming in contact with the fumes, including the housing and wheel, are constructed entirely of solid, unplasticized polyvinyl chloride, and consequently are unaffected by the corrosive conditions. The



fan is provided with heavy, oversize, outboard bearings and is designed to operate at well below its critical speed, assuring continuous, uninterrupted service life.

* * *

This fan replaced a coated steel fan which had been entirely overhauled with new impeller, bearings and shaft after only eight months service, and had completely broken down after eighteen months service, having accumulated more than $1100.00 of repair and lost production charges. Plant personnel estimate that the Heil all plastic fan will save more than $4500.00 in repairs and maintenance, and immeasurable savings in uninterrupted production during the next ten year period.

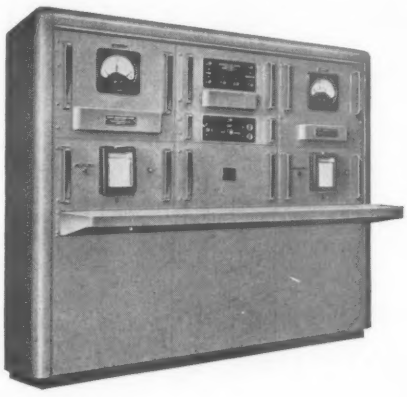
* * *

Heil Solid Plastic Fans in either "Rigivin" (solid vinyl) or "Rigidon" (reinforced plastic) construction are manufactured by **Heil**

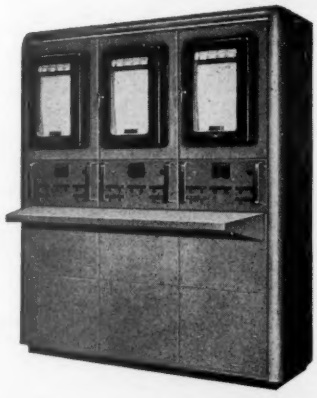
ADDISON ELECTRIC

CABLEMAKERS INSTRUMENTATION

The most advanced—most complete—and most versatile in the world
In use in over 200 Cable plants—and in more than 30 countries



Typical small Extrusion Control Station, combining Automatic Capacitance with Size Control and Recording



Small Impregnation Control Station for 3 Vacuum Impregnation Tanks

Ingenious system of building blocks permits extension, modification, and assembly of hundreds of different combinations of Control stations, to individual requirements, at moderate cost.

ADDISON'S UNIQUE RANGE OF UNITIZED SYSTEMS COMPRISE

* Cable Eccentricity Monitors and Controllers
* Wire Preheaters with automatic Temperature Control
* Corona Test Sets for scanning and final Tests
* Optical scanning size Monitors and Controllers
* Wall Thickness and Dual Plane Controllers
* Contact Size Monitors and Controllers
* Capacitance Monitors and Controllers
* High Frequency and D.C. Spark Testers
* Cable Impregnation Monitors
* Wire Tension Gages—etc.

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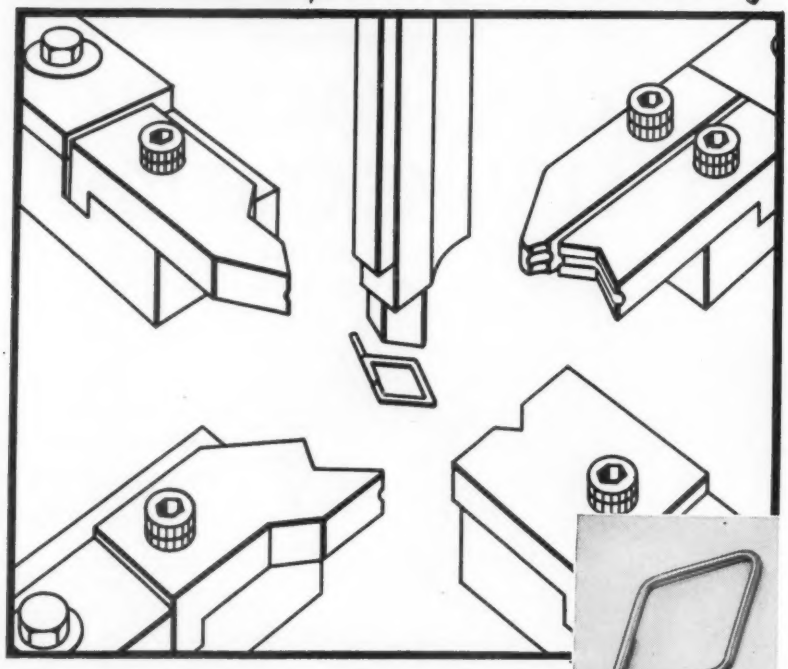
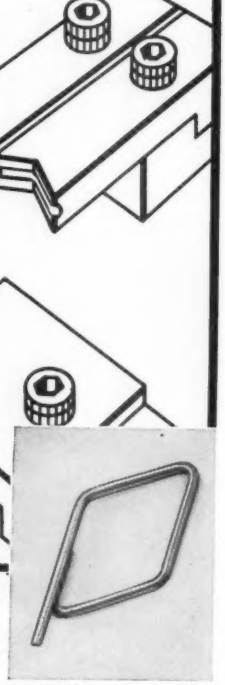
428/3

NILSON 4-SLIDES

FORMING PRODUCTION PROFITS... *Automatically*





PRODUCT: Deadlock Hook
MATERIAL: Soft Basic Wire
PRODUCTION: 280 Pieces Per Minute
MACHINE: No. S-0 Nilson 4-Slide

16,000 PARTS PER HOUR on a NILSON *Automatic* 4-SLIDE

Whether your product is formed simply . . . or requires complex bending in several planes . . . a Nilson 4-Slide may be the solution to your production problems.

The sketch above shows the tooling used by a leading manufacturer to mass-produce metal hooks—at the rate of 280 pieces per minute! A Nilson 4-Slide has proved to be the most efficient, economical way to manufacture this product . . . and many other kinds of wire forms and small metal stampings.

Manufacturing costs must be kept down to meet today's competition. The combination of high speed and product uniformity—basic advantages of Nilson 4-Slides—means maximum production, minimum operating costs.

Before you design, tool, or specify manufacturing methods for your product, get in touch with Nilson. Over 60 years of experience with wire and metal forming applications can help you form better products . . . more profitably.

SIZE RANGES:
Wire up to ½" diameter
Ribbon stock to 3½" wide
Feeds up to 32"
5 TO 75 TON PRESS SECTIONS

NILSON
THE A. H. NILSON MACHINE CO.
625 Bridgeport Avenue • Shelton, Conn.
AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio, in a wide range of standard sizes to meet any requirement.

New Bulletin on Safpowrbar Electrification

A new illustrated bulletin just off the press describes Cleveland Tramrail "Safpowrbar" conductor systems for providing electrification of maximum safety and unusually long life on overhead materials handling equipment.

* * *

Bulletin No. 2016-D will be sent free upon request by the **Cleveland Tramrail Division,** The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Brochure Describes Copper-Plated Steel Wire

A new brochure now available from **National-Standard Company** describes Copperply, its copper-plated steel wire. The brochure gives detailed information on the use of Copperply for bare and insulated communications wire, rural distribution wire, drop wire, guy and messenger strand, overhead ground wire, lashing wire, aircraft antenna, masonry tie wire, hose reinforcement, tinsel, decorative jewelry and critical electronic applications.

* * *

Specifications are listed for gauge tolerance, scope and grade, elongation, resistivity, torsion, bending, wrapping and ferroxyl tests. Properties tabulated include sizes vs. copper thickness, breaking load, weight and resistance.

* * *

Copperply is manufactured by a continuous spiral plating process perfected and owned by National-Standard. The wire is REA-approved and conforms to ASTM Specification B-227 and Federal Specification QQ-W-345. It is available in weld-free lengths to 1000 lbs. Standard 200-lb coils, 800-lb reels, and 1000-lb reelless coils are available.

* * *

Bulletin 203 describing Copperply may be obtained free upon request from National-Standard Company, Niles, Michigan.

Patents and Inventions — An Information Aid for Inventors

Inventors now can turn to a new information pamphlet just published by the U. S. Patent Office containing basic information as to patenting and patent procedures, and related information which may prove helpful in the development and marketing of their inventions. Copies are available through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at a price of 15 cents per copy and the Department of Commerce Field Service Offices in cities where such offices exist. Also available at the same price — "General Information concerning Patents" and "General Information Concerning Trademarks".

Amchem Announces Improved Alodine

Amchem Products, Inc., Ambler, Pa., has announced an important chemical development, Alodine 1200S, latest addition to its line of amorphous chromate coatings for aluminum.

* * *

Alodine 1200S answers one of the most perplexing problems inherent in providing corrosion protection and paint bonding qualities for aluminum by chemical means — the problem of uniform quality.

* * *

Incorporating increased chemical activity over its predecessors, Alodine 1200S provides up to 50 percent faster processing, more uniformity of coating, and a higher grade of coating. It is particularly recommended for use in high production baths.

* * *

Available from Amchem with the Alodine 1200S process is the first automated cleaning and coating for this type of operation on strip lines. Automated Alodine 1200S provides a high degree of chemical control during processing, while reducing the number of man hours required to maintain the bath.

Our Advertizers are Reliable Patronize Them

For Moisture Resistance, Specify

TEXTILENE TWI-FLEX and TWI-WAX

Treated to reduce wicking and prevent leaching, lightly waxed Textilene Twi-Flex and heavily waxed Textilene Twi-Wax provide effective resistance to moisture. Both fillers are extensively employed for non-metallic sheathed cable (building wire), maritime shipboard cable, varnished cambric cable, and underground service entrance cable.

Twitchell's superior Textilene line also includes: Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all portable and flexible cords. Fungus-resistant filler — *Twi-Tar*. Used for buried communications cable, expanded ACSR cable, and in other applications.

*Patent Applied For

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation—also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E. W. TWITCHELL INC.

Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

Outstanding Personalities of the Wire Industry

Appointed to Sales Staff by Nopco

The appointment of **Emre Bleier** as a sales representative for the Industrial Division of **Nopco Chemical Company,** Newark, N. J., has been announced by **Robert F. McClellan,** vice-president and general sales manager of the division. Mr. Bleier replaces **William J. Gavin,** who has been made a regional sales manager; he will cover Mr. Gavin's former territory, which includes metropolitan New York; New Jersey; Philadelphia; Wilmington, Delaware; and parts of Pennsylvania.

Thompson to Head Borax and Chemicals

William J. Hatchley has retired as managing director of **Borax & Chemicals, Ltd.,** and **George H. Poole & Co.,** British subsidiaries of American Potash & Chemical Corporation, a post he has held since 1939. He will continue as a director of both subsidiary companies.

* * *

George L. Thompson, formerly general manager of Borax & Chemicals, has been named to succeed Mr. Hatchley as managing director of both companies.

Heads Research for Triangle

The appointment of **Roger E. Martin** to the position of Director of Research and Development of the **Triangle Conduit and Cable Co., Inc.,** New Brunswick, N. J., has been announced by **Clyde V. McKay,** Vice President-Operations. Previous to this appointment, Mr. Martin had been Chief Metallurgist for the Company.

* * *

In his new post, he will supervise and direct all Experimental Research and Development projects for the Company. The department in which he was named Director was recently re-organized and staffed to intensify Triangle's new product development program.

* * *

Mr. Martin attended Columbia University and has spent four years as a Chemist with the Revere Copper and Brass Company's Taunton - Bedford Division and seventeen years with the Phelps Dodge Copper Products Corporation at Elizabeth, N. J. where he successively was Chemist, Metallurgist and Research Metallurgist in Charge of the Research Department.

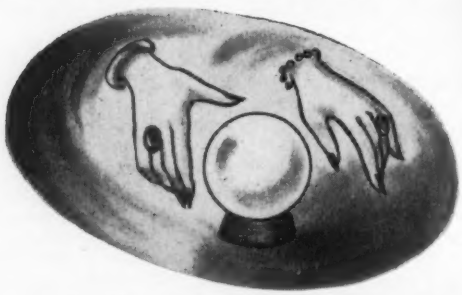
* * *

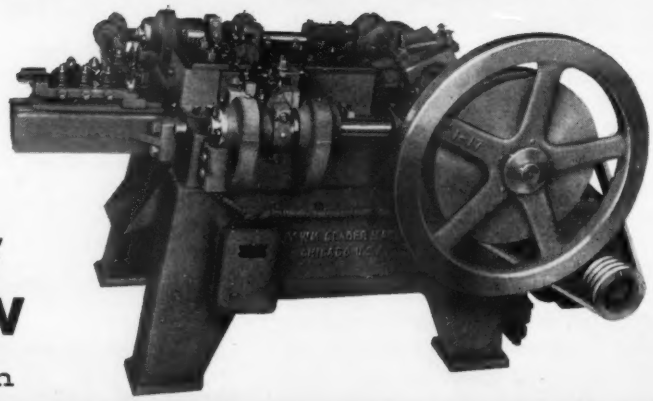
Triangle is a leading manufacturer of Electric Wire and Cable, Conduit, Copper Tube and Plastic Pipe.

New Executive at Wheelabrator

The appointment of **William**

IF THERE'S A NAIL MACHINE IN YOUR Future make it a GLADER





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Butler, III as Administrative Assistant to the President of **Wheelabrator Corporation** has been announced by **James F. Connaughton**, President.

* * *

Mr. Butler was educated in Haverford College in Haverford, Pa., and has since occupied various executive positions at Lukens Steel Company.

Association Clock Wound for 1960

Mr. and Mrs. Douglas Gledhill called at The Wire Association headquarters in Stamford on November 9, 1959, at which time Mr. Gledhill wound the grandfather clock so that it will run for another four hundred days.

* * *

The clock, a gift of our British members to The Wire Association, was formally presented to the Society during the Annual Convention of the Association in Pittsburgh, Pennsylvania, in 1948 by **John Rigby**, Managing Director of **John Rigby & Sons, Ltd.**

The works of the clock are of fairly recent manufacture, being one of a limited number produced. They are of master-craft precision construction and a thing of beauty to behold. The handsome case, also an example of fine workmanship, was made about the year 1770.

Douglas Gledhill

* * *

Mr. Gledhill performed the ceremony officially on behalf of our British Association members, the clock being traditionally wound each year about this time by a member from England designated to accomplish this pleasant and not too onerous task.

* * *

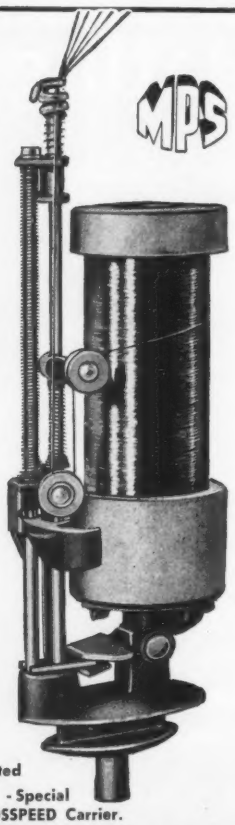
The Gledhills were in this country for an extended stay, during which they visited a number of wire mills and had attended the Annual Convention in Cleveland in October.

* * *

Mr. Gledhill is Managing Director of J. & A. Binns Limited, of Halifax, England, manufacturers of wire.

Rope Firm Appoints Wire Sales Manager

Union Wire Rope Corporation, subsidiary of **Armco Steel Corporation**, has promoted **L. A. (Larry) Davis** to the position of manager of Wire Sales. After eleven years



Patented
2 BX - Special
MOSSPEED Carrier.

MOSSPEED BRAIDER CARRIERS

For Braiding
MULTIPLE ENDS OF FINE WIRES

A special design MOSSPEED CARRIER and BOBBIN is supplied for braiding "SHIELDED" WIRE, ETC.

Will braid multiple ends of aluminum, brass, bronze or copper wire, etc.

TWO SHEAVE-WHEELS and SPECIAL-TOP-THREADEYE on carrier, together with new type BOBBIN provides an even wire "let-off" resulting in a high quality and uniform braided shield.

Consult our engineers regarding your braiding problems.

Mossberg PRESSED STEEL Corporation

"Division of Wanskuck Co."

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ATTLEBORO, MASSACHUSETTS, U.S.A.

Telephone
ATTLEBORO 1-0848

European Agent
James Day (Machinery), Ltd., 28 Maddox Street, London, W. I., England.

100

as wire rope sales representative, Mr. Davis has undergone an intensive training course in the mill and laboratory to qualify as specialist in wire.

* * *

A sizeable and growing segment of Union Wire Rope's production is devoted to the custom drawing of high carbon steel wire for manufacturers across the country where it is used as a functional part of other manufactured products. Mr. Davis, a graduate of Kansas University, will serve manufacturers in customizing wire for their particular end uses.

Appointed Chicago District Sales Manager

Edward E. Franks, Jr. has been appointed District Sales Manager in Chicago for the Machine Division of **The Torrington Manufacturing Co.,** producer of wire-forming equipment, flat wire mills, and vertical four-slide machines. Mr. Franks, who has been Chief Engineer of the Machine Division for ten years, will expedite field quotations on machines and parts and expand engineering services in the midwest, steps which are in large part due to the broad acceptance of Torrington Manufacturing's new Verti-Slide wire and strip forming machines.

* * *

Edward Keating and **Arthur Fortin,** under Franks' direction, will continue to cover Illinois, Indiana, Wisconsin and part of Minnesota from Torrington Manufacturing's new, enlarged quarters at 6034 North Cicero Ave., Chicago. This office will also include sales and engineering services for the fans, blower wheels, impeller units, and special blowers produced by the company's Air Impeller Division.

* * *

A graduate in mechanical engineering from Worcester Polytechnic Institute, he began as a machine designer at the company's main plant in Torrington, Conn. in 1942 and seven years later was made Chief Engineer.

* * *

Joins FS Sales Staff

Firth Sterling Inc. announces the appointment of **Paul W. Knapp** as sales engineer, carbide division, in the Boston area. Mr. Knapp has a long and successful background in the carbide business, having served as tool & die design engineer with the **Metallurgical Products Department,** General Electric Company, before joining **Hartley Tool & Die Co.,** Thomaston, Conn., as chief engineer in 1946. He was promoted to vice president in charge of manufacturing, in which capacity he served before coming with Firth Sterling. Mr. Knapp is a member of the American Society of Tool Engineers.

Norton Sales Appointments

Robert Cushman has been appointed sales manager of **Norton Company's** Abrasive Division. **W. Alex McCune** succeeds Mr. Cushman as sales manager of grinding wheels.

LOW COST
precision wire plating
MAINTAIN UNIFORM COATINGS AT HIGH SPEEDS!
CONTINUOUS
ELECTROPLATING
EQUIPMENT
This low cost equipment performs with ease and efficiency that mean real savings. Preset quality control insures perfection without depending on operators' skill. No toxic fumes, clean operation at low temperature, elimination of work hardening during processing and many other features are the result of experience and sound engineering that go into the design of all Universal equipment.
We furnish complete installation . . .
For further information write to:
UNIVERSAL INDUSTRIAL EQUIPMENT CO.
SECAUCUS, NEW JERSEY
SOLE AGENT IN CANADA: E. V. LARSON CO., LTD., TORONTO, CANADA
U. S. PATENT # 2823180 AND FOREIGN PATENTS PENDING

Harlan T. Pierpont has been appointed sales manager of abrasives, succeeding **George A. Park** who retired October 1 after a Norton career of 50 years.

* * *

William A. Russell, formerly Detroit district manager, returns to the Worcester, Mass., office to assume Mr. McCune's former post as manager of field sales, grinding wheels. **David H. Paul,** formerly an abrasive engineer in the Baltimore area has been named district manager at Detroit.

Wheelabrator Advances Pfaff

The appointment of **George O. Pfaff** as Director of Marketing at **Wheelabrator Corporation,** Mishawaka, Ind., has been announced by **J. F. Connaughton,** President.

* * *

In addition to supervising Abrasive Sales, he will be responsible for marketing Wheelabrator's general products and Techline Division equipment and supplies. He joined Wheelabrator in 1953 in the Sales Promotion Department. Later he was made Manager of Standard Equipment Sales. In 1956 he organized and became the head of the Abrasive Sales Division, the position held until now.

* * *

Prior to joining Wheelabrator Corp., Mr. Pfaff spent two years in the Textile Division Sales Department of Owens-Corning Fiberglas Corporation, New York City. He attended the University of Notre Dame where he received a B. S. degree in Chemical Engineering and the University of Pennsylvania's Wharton School where he earned his master's degree in Business Administration.

Wire Firm Names Sales Manager

The Branford Machine & Mfg. Co., North Haven, Conn., producers of High Carbon and Stainless Steel wire announces the appointment of **Robert L. Space** as Sales Manager.

* * *

Prior to joining Branford Machine Mr. Space was Sales Manager of the Smith & Winchester Mfg. Co. According to **George E. Seeley,** Vice President, Branford Machine has recently acquired additional new equipment and this appointment is in line with their current expansion program to increase their capacity and range of sizes available.

Loewy Hydropress Appointments

William L. Govan, chief project engineer of **Loewy-Hydropress Division** of Baldwin-Lima-Hamilton Corporation was appointed to assume the additional functions of Product Sales Manager for hydraulic machinery.

* * *

An honor graduate mechanical engineer of the University of Toronto where he subsequently lectured on machine design and hydraulic machinery, he has been with Loewy-Hydropress since 1951. He is widely known as a technical writer.

* * *

Gerald L. Sanders was appoint-

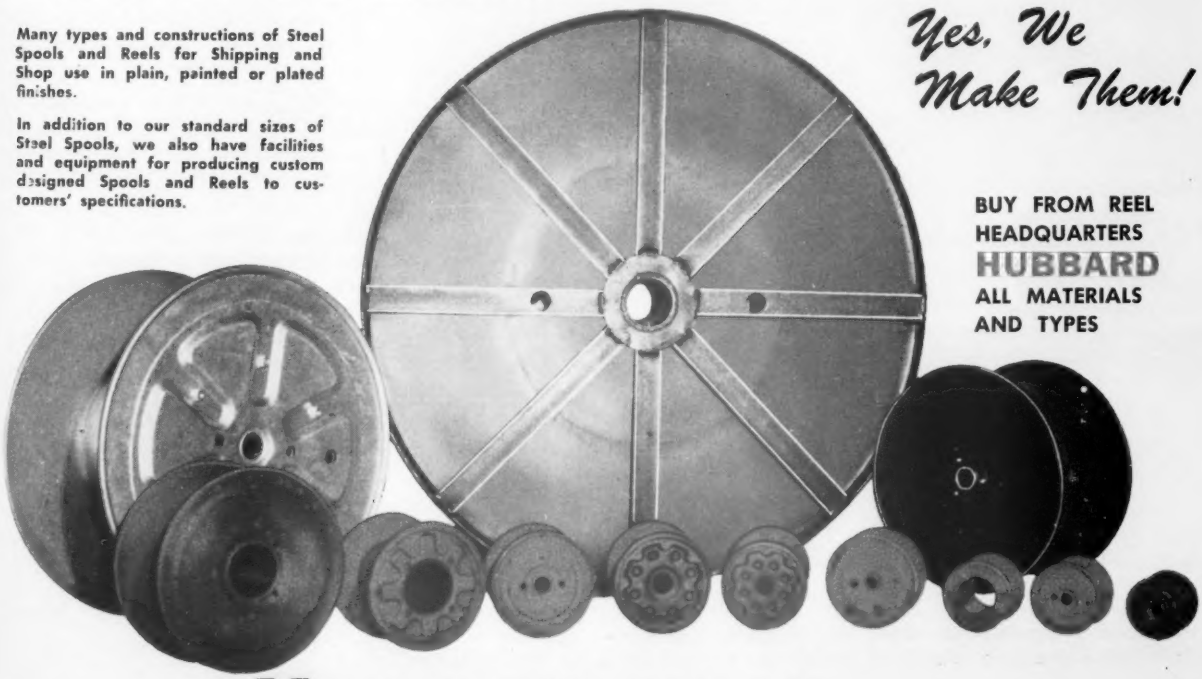
Steel SPOOLS and REELS?

Many types and constructions of Steel Spools and Reels for Shipping and Shop use in plain, painted or plated finishes.

In addition to our standard sizes of Steel Spools, we also have facilities and equipment for producing custom designed Spools and Reels to customers' specifications.

Yes, We Make Them!

BUY FROM REEL HEADQUARTERS
HUBBARD
ALL MATERIALS AND TYPES



HUBBARD SPOOL DIVISION
The American Pulley Company
TELEPHONE: GARRETT 840 GARRETT, INDIANA

ed Product Sales Manager, rolling mill department of the same company. He is a graduate mechanical engineer with extensive international experience in the design and manufacture of rolling mills, metalforming machinery and production machinery for tools and dies, and is a specialist in development of plants, installations and equipment for the production of steel and nonferrous metals. He joined the company in 1947.

G.E. Appoints Local Sales Representatives

Appointment of two new sales representatives for the Michigan District Sales Office of the **Metallurgical Products Department,** General Electric, Detroit has been announced.

* * *

They are Bruce R. Best, who will represent the firm in metropolitan Detroit and Toledo, and **Edward L. Boersig,** who will serve as the firm's representative in Eastern Michigan. Both report to John Muldoon, manager of Michigan District Sales.

* * *

They will handle Carboloy cemented carbide cutting tools, dies, and component parts, and sales to distributors.

New Manager for G-E Southern District

C. W. Powell has been appointed manager, Southern District, for Metallurgical Products Department of the **General Electric Company,** effective August 1, 1959.

* * *

Mr. Powell, a veteran of 23 years with G-E is a former manager of the Pittsburgh District Office. He also served as a salesman in St. Louis, Cleveland and Chicago. Most recently he was assigned to the Chicago office as a Sales Specialist.

* * *

He is a graduate of DePauw University where he majored in physics, after graduating from Cass Technical High School in Detroit. The firm's Southern District headquarters are in Atlanta.

YS&T Names Superintendents

E. O. Reese, Youngstown District Manager, of **The Youngstown Sheet & Tube Co.,** has announced the appointment of **J. Paul Tierney** as Superintendent of the rod, wire and conduit departments of the Struthers Plant, of which he had been Assistant Superintendent since 1953. He succeeds the late **Joseph Williams.**

* * *

Walter J. Prochak was named Superintendent, cold draw bar department at the Briar Hill Plant, replacing **Floyd Hoskinson,** who retired on September 1.

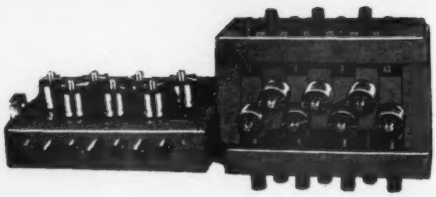
* * *

Robert G. Griffith succeeds **George T. Radford,** also retired, as Superintendent of the seamless tube mills at the Campbell Works. He was general foreman there.

* * *

At the Campbell Works, **Marcus B. Appleton,** formerly General Foreman, galvanizing department,

ROLL STRAIGHTENERS . . .



WIRE STRAIGHTENER CAPACITIES					
Style	Wire Range Min.	Wire Range Max.	Roll Diameter	No. of Rolls	Weight
RS-00	.016	.031	7/16	14	3
RS-0	.030	.062	5/8	14	7
RS-1	.050	.093	7/8	14	14
RS-2	.090	.187	1 3/8	10	22
RS-3	.150	.250	1 15/16	10	64
RS-4	.200	.375	2 5/8	10	112
RS-5	.300	.500	3 5/8	10	250
RS-2-14	.090	.187	1 3/8	14	36
RS-3-14	.150	.250	1 15/16	14	63

FOR WIRE, BAR, TUBE IN ROUND, SQUARE AND HEX

Straightens Ferrous & Non-Ferrous Metals prior to Forming, Heading, etc. Hardened & Ground Tool Steel Rolls Mounted on Needle Bearings. All Rolls Are Adjustable. Machined Surface on Vertical Plane for Mounting.

WRITE OR PHONE FOR INFORMATION

STEEL & WIRE MACHINERY COMPANY, 15457 EUCLID AVE., CLEVELAND

has been made Assistant Superintendent of the couplings department, and **R. J. Barthomoly,** formerly turn foreman, has been named Assistant Superintendent of the open hearth department.

Lenhart Joins Crucible Steel

Robert E. Lenhart has been appointed Supervisor of Silicon Steels in **Crucible Steel Company's** Central Research Laboratory. He was formerly Manager of Alloy Development at the **Beryllium Corporation** in Reading, Pa.

* * *

A native of Portsmouth, Ohio, Mr. Lenhart attended Ohio State University where he received a Bachelor of Science degree in Metallurgy. He also holds a Master of Science degree in Metallurgy from Rensselaer Polytechnic Institute.

Named Works Manager of Chain Belt's Milwaukee Plants

The appointment of **Kenworthy J. Thompson** as Works Manager of its plants in Milwaukee county has been announced by **Chain Belt Company,** Milwaukee.

* * *

As works manager, he will be responsible for manufacturing and production in the company's chain and transmission division, heavy machinery division and foundries, and for the operations of the methods and tool design, personnel and maintenance departments.

* * *

Mr. Thompson joined Chain Belt in June 1946 as a student engineer. Since then has served as assistant manager of ordnance, factory manager of the company's Los Angeles plant and, most recently, as manager of factory services in Milwaukee. He is a mechanical engineering graduate of Purdue University.

Crucible Steel Names Sales Executive

Crucible Steel Company of America has named **Maurice J. Day,** former Vice President - Technology, to the newly created post of Vice President - Commercial in an expansion of its sales organization. In his new position, he will have full responsibility for sales management in Crucible.

Joel Hunter, company president said, "This organizational change is important to filling a need effected by Crucible's rapidly expanding interests in special steels and other metals such as titanium and vacuum melted materials. These materials are required to support new scientific and technological developments in ever-widening markets, both domestic and world wide."

* * *

Geo. W. Stamm, Vice President of Sales, continues in that position with executive responsibility for trade and commercial relations and sales policy planning and promotion.

* * *

Walter E. Gregg succeeds Mr. Day as head of the Technology Department with the title of Director of Technology. He also continues in his present position with Crucible as Director - Technical Development Division.

Next to diamonds in hardness...

NORBIDE* abrasive costs 300 times less

Refinishing wiredrawing dies with NORBIDE* abrasive is your short cut to extra efficiency and economy. Next to diamonds and diamond dust, NORBIDE grain is the hardest manufactured abrasive commercially available. Yet it costs 300 times less than sized commercial diamonds.

Get the facts on how this Norton-developed abrasive can bring high quality and steady savings to your die refinishing operations — including ripping, semi-finishing and sometimes finishing. For details and prices write to NORTON COMPANY, General Offices, Worcester 6, Mass.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

G-374

NORTON
BORON CARBIDE

Making better products...to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

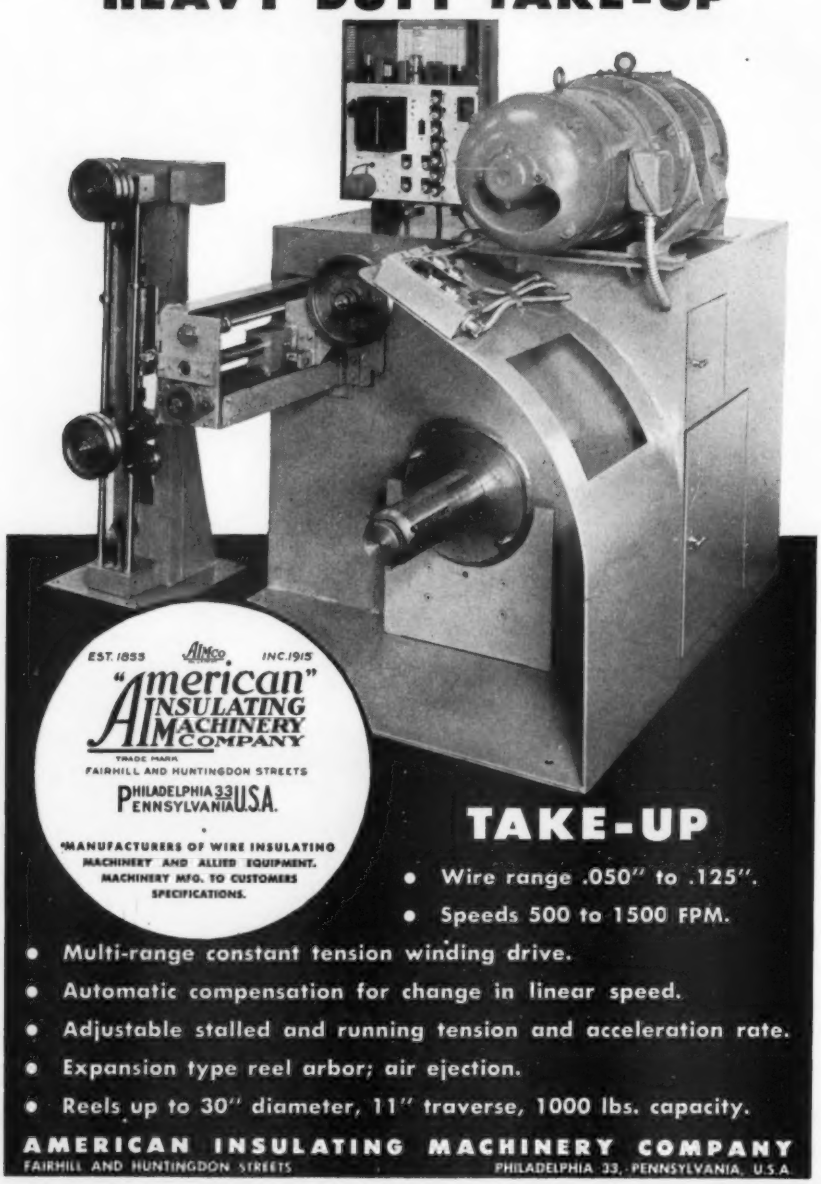
Autolite Appointments

New managers for two sales regions of **The Electric Autolite Company's** General Products Group have been announced by Group Sales Manager, **S. T. Rose.** The appointments follow the selection of former Western Regional Sales Manager, **J. M. Gerber,** as Operations Manager for the Group's Hazleton, Pa., facilities.

* * *

Succeeding Mr. Gerber as Western Regional Manager, with headquarters in Los Angeles, is **D. M. Skirving.** Most recently Eastern Regional Sales Manager, Mr. Skirving has been with Autolite since 1933 and prior to consolidation of the Group's sales efforts, he headed Autolite wire and cable sales. At one time he headed west coast sales for wire and cable and will be returning to direct activities for this line as well as the Group's plastics, hydraulics, ceramics and metal fabricating sales.

* * *


HEAVY DUTY TAKE-UP
EST. 1853 AIMCO INC. 1915
"American"
INSULATING MACHINERY COMPANY
TRADE MARK
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.
MANUFACTURERS OF WIRE INSULATING MACHINERY AND ALLIED EQUIPMENT. MACHINERY MFG. TO CUSTOMERS SPECIFICATIONS.
TAKE-UP
• Wire range .050" to .125".
• Speeds 500 to 1500 FPM.
• Multi-range constant tension winding drive.
• Automatic compensation for change in linear speed.
• Adjustable stalled and running tension and acceleration rate.
• Expansion type reel arbor; air ejection.
• Reels up to 30" diameter, 11" traverse, 1000 lbs. capacity.
AMERICAN INSULATING MACHINERY COMPANY
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33, PENNSYLVANIA, U.S.A.

Replacing Mr. Skirving as Eastern Regional Sales Manager is **Virgil R. Steinmeyer,** previously Chicago District Manager for the Group. He joined Autolite in 1950. He will headquarter in New York City.

* * *

Two sales territories have been transferred to the Group's Mid-Central Region, which adds the states of Michigan, Wisconsin and Minnesota under Mid-Central Regional Manager, **K. L. Gackel.**

To Handle Traffic for Triangle

The appointment of **John F. Bahr** to the position of General Traffic Manager of the **Triangle Conduit & Cable Co., Inc.,** New Brunswick, N. J. has been announced by **Joseph G. Slater,** President. He joined Triangle in 1942 and succeeds the late **Henry Hahn,** who had the distinction of being the first male employee of Triangle when the firm was founded in Brooklyn, N. Y. in 1916.

* * *

In his new post, Mr. Bahr will supervise the planning and coordination of transportation facilities for shipment of Triangle products from company manufacturing plants located in New Brunswick and Landisville, N. J. and Moundsville, W. Va.

* * *

At the same time Mr. Slater also announced that **Stephen Belansky** and **Peter E. Johnson** have been advanced to the position of Director and Assistant Director of Public Relations, respectively.

* * *

Triangle is a leading manufacturer of electrical wire, cable, conduit, copper tube, plastic pipe and is presently completing facilities in Landisville, New Jersey, for the production of Bituminized-Fiber Pipe.

Appointed to Crucible Technical Staff

John P. Strand, formerly Division Superintendent - Titanium at the **Crucible Steel Company's** Midland (Pa.) Works, has been appointed Assistant Director of the Technical Division in the Com-

pany's Technology Department. He will be responsible for the Product Development Sections.

* * *

Mr. Strand began his career in industry in 1942 when he joined Bethlehem Steel Company in Johnstown, Pa. In 1953 he joined Rem-Cru Titanium, Inc., then jointly owned by Crucible and Remington Arms. When Crucible acquired full ownership of Rem-Cru and integrated the titanium manufacturing into the Company's Midland (Pa.) Works, he was named Division Superintendent - Titanium. He was graduated from Penn State University in 1942 with a Bachelor of Science degree in Metallurgy.

American Potash Transfers Rice

Robert P. Rice, formerly chief chemist at **American Potash & Chemical Corporation's** Henderson, Nev., plant, has been transferred to the firm's Los Angeles sales office where he will provide technical sales service to the company's ammonium perchlorate customers, according to **W. M. Clines,** general sales manager, Western.

* * *

Mr. Rice obtained broad knowledge of ammonium perchlorate and its uses while he was employed in the Research Department at Henderson prior to becoming chief chemist.

Titeflex Appointments

George Derum has been made Manager of Marketing, Commercial Sales Div.; **Daniel W. Ruple** has been appointed Vice President and General Manager of the Pacific Division in Santa Monica, Cal.; and E. M. Ramberg has been elected Vice President of Marketing, according to announcements by **Matthew J. Betley,** President of **Titeflex, Inc.,** Springfield, Mass.

* * *

Titeflex, a subsidiary of Atlas Corp., is a leading producer of flexible hose with related fittings, electrical shielding and electrical components, and aircraft and industrial products.

U. S. I. Elects Vice President

Ralph M. Knight has been appointed a Vice President of **U. S. Industrial Chemicals Co.,** Division of National Distillers and Chemical Corp. The appointment was announced by **Dr. Robert E. Hulse,** Executive Vice President of National Distillers and General Manager of the U.S.I. Division.

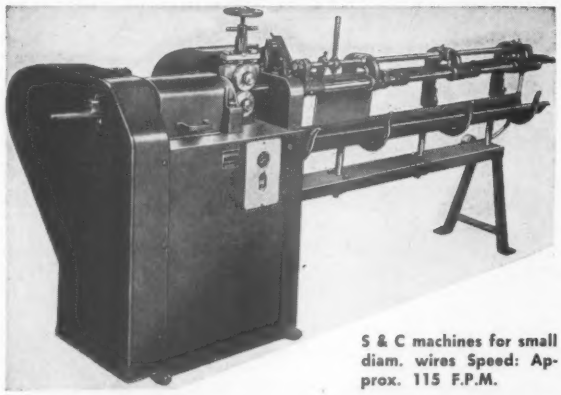
* * *

In his new position Mr. Knight will intensify U.S.I.'s long-range polyolefin development program. He will continue to direct the Polymer Service Laboratory as well as to coordinate its efforts with other plastics activities within the company.

* * *

Since joining the company in 1953, he has served in various production capacities. He holds a Bachelor of Science degree in Chemical Engineering from Newark College of Engineering, a member of the class of 1939. From 1939 to 1952 he was associated with duPont's Ammonia and Polychemicals Department and between 1952 and 1953 he was in the Research Department of Standard Oil Com-

New! Improved! Fast!
WELLS STRAIGHTENER & CUTTER



S & C machines for small diam. wires Speed: Approx. 115 F.P.M.

This completely redesigned line combines maximum efficiency with that rugged dependability, for which WELLS S&C machines have become justly famous.

Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.

FEATURES

The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.

A COMPLETE RANGE OF S & C MACHINES IS MADE BY WELLS FOR ALL SIZES OF WIRE. SEND FOR CATALOG ON THE COMPLETE LINE.

Frank L. Wells Company

Builders of Fine Wire Working Machinery

5821 FIFTH AVENUE • KENOSHA, WISCONSIN

pany at Whiting, Indiana.

Bjorksten Adds to Staff

Dr. L. F. Yntema is now acting as consultant at **Bjorksten Research Laboratories,** Madison, Wis., on research and development of foamed metals. Formerly Vice President, Director of Research of Fansteel Metallurgical Corp. and Senior Metallurgist at Stanford Research Institute, Dr. Yntema has a distinguished background in the fields of Inorganic and Electrochemistry, Rare Earths and Refractory Metals. He holds many patents in these fields.

* * *

Dr. Stanley A. Dunn, formerly of Rhodia, Inc., has also joined the laboratory to supervise projects involving improved materials using high temperature and high pressure techniques.

* * *

Other recent additions to the expanding technical staff of Bjorksten Laboratories are **Edward J. Rock, Jr., Vernon K. Rising, Gordon Jensen, Arnold Flagel, Darrell Lien, Melvin Blahnik** and **Arthur Sincere. Joel N. Lipscomb** and **Catherine J. McGough** have recently joined the staff of Bjorksten Texas Research Co. at Houston, Texas.

Research Institute Names Officers

Herman J. Galamba, of Sonken-Galamba Corp., Kansas City, Kans., was named president of the Aluminum Smelters Research Institute at the national association's annual election of officers, it was nounced on September 25. He succeeds **J. M. Stone,** of the Aluminum Smelting and Refining Company, Cleveland.

* * *

Named vice-president was **Dr. John P. Brull,** of North American Smelting Company, Wilmington, Del. **D. H. Warner,** of Aluminum and Magnesium, Inc., Sandusky, O., was elected treasurer. **Carl H. Burton** remains as secretary of the Institute, with headquarters at 20 N. Wacker Dr., Chicago 6, Ill.

U. S. I. Appoints Atlanta Manager

John A. Putnam has been appointed Manager of the Atlanta office of **U. S. Industrial Chemicals Co.,** Division of National Distillers and Chemical Corp., **A. R. Ludlow, Jr.,** Vice-President-Sales, has announced.

* * *

Mr. Putnam has been a salesman for U.S.I. at New Orleans since 1952 and has been located in Atlanta for the past two years. He attended the University of Michigan.

Joins Scott Testers as Sales Engineer

Walter E. Anderson has been appointed as Sales Engineer by **Scott Testers, Inc.,** according to a recent announcement by **David C. Scott, Jr.,** president. The firm manufactures physical testing equipment for textiles, paper, plastics, wire, leather and other basic industries. In his new position, Mr. Anderson will be responsible for sales of Scott testers

Important Announcement!

NEW ADVERTISING RATES

FOR THE 1960 EDITION OF THE

WIRE AND WIRE PRODUCTS BUYER'S GUIDE AND YEAR BOOK OF THE WIRE ASSOCIATION

After holding the advertising rates in this highly useful directory for more than 20 years, costs have caught up with us and we are forced to announce an increase for the 1960 Edition.

At the same time, the closing date for advertising has been moved ahead one month to February 20 as a convenience to advertisers, and the publication date changed to May 1st.

The Buyer's Guide, the only directory published exclusively for the Wire Industry, has been issued as a non-profit service to the field. It carries the most complete lists collected in any one publication of bar, rod, wire, wire products, electric wire and cable, and all machinery, equipment and supplies consumed by the industry. The 1959 issue contained approximately 450 pages of data on buying sources and other pertinent industry information.

If you have not received a copy of the new advertising rate card for the 1960 Edition of the BUYER'S GUIDE, please write for it.

WIRE AND WIRE PRODUCTS

453 MAIN STREET • STAMFORD, CONN.

throughout the continental United States.

* * *

Mr. Anderson was previously associated in a sales capacity with the Thomas & Betts Co., and the Minnesota Mining & Manufacturing Co., covering the New England area.

Page Steel & Wire Appoints New Houston District Sales Manager

F. Howard Cobb, who had been the Cincinnati, Ohio resident salesman for approximately two years, has been appointed to the position of District Sales Manager, Houston, Texas, according to an announcement made by **Joseph N. Kemple,** General Manager, **Page Steel & Wire Division,** American Chain & Cable Company, Inc., Monessen, Pa.

* * *

Born in Van Wert, Ohio, Mr. Cobb is a graduate of Miami University, Oxford, Ohio, with a B.A. degree in Industrial Management.

Camden Wire Adds to Sales Staff

Camden Wire Co., Camden, N. Y., manufacturers of copper wire and bunched, stranded and tinned wire for electrical conductors, has announced the appointment of **Bernard L. Spencer** to its sales staff. Mr. Spencer will serve eastern New York and Pennsylvania, and New Jersey, Delaware, Virginia and North Carolina.

* * *

At the same time **J. F. Mahon,** Sales Manager, announced that **Harry A. Schofield's** territory had been shifted to include Western Pennsylvania and New York, and the states of Ohio and Michigan. **Daniel P. Courtney** will cover the New England States and Ontario, Canada.

Geyer Promoted by Amchem Products

John Geyer, Manager of the Product Development Department, Metalworking Chemicals Division, **Amchem Products, Inc.,** Ambler, Pa., has been promoted to Technical Assistant to Amchem's President, **Gerald Romig.**

He will be succeeded in the Product Development Department by **Hugh Gehman,** who has been his assistant since January 1955.

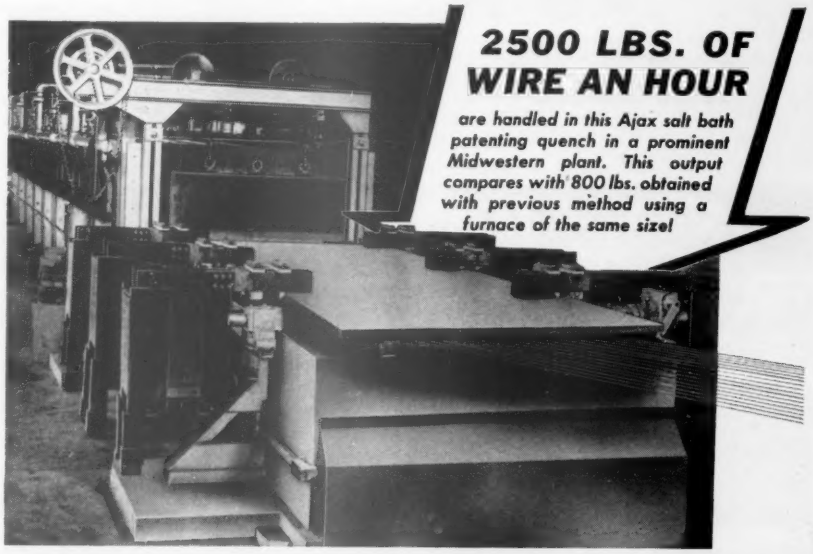
* * *

Mr. Geyer, a graduate metallurgical engineer of the 1949 Class of Lehigh University, joined Amchem in December, 1950, as a metalworking chemical technician, becoming Manager of the Metalworking Chemicals Development Department in 1953. Prior to this he was a plant metallurgist with the Aluminum Company of America, Massena, New York.

Rome Cable Appoints Product Manager

The appointment of four product managers for the **Rome Cable Division** of Aluminum Company of America has been announced by **R. L. Williamson,** vice president and general sales manager of the Rome division.

* * *


2500 LBS. OF WIRE AN HOUR
are handled in this Ajax salt bath patenting quench in a prominent Midwestern plant. This output compares with 800 lbs. obtained with previous method using a furnace of the same size!

Here's maximum speed, accuracy and economy in Wire Patenting!

No other method offers so many possibilities for quality improvement and cost reduction in the patenting of high- and medium-carbon steel wire or rods. Automatic temperature control—an inherent result of Ajax internally-heated salt bath furnace design—provides continuous accuracy within ±5° F. throughout the bath. You are thus assured of the uniformity so vital to obtaining proper tensile strength and grain structure.

More poundage can be handled. Savings up to 30% in pickling time are common. Salt residue is easily removed by a water wash. The entire patenting process lends itself readily to inexpensive automation. Maintenance is negligible. Long-life, immersed-type electrodes can be changed in an hour or two—without tearing down furnace or pot. Pots last indefinitely.

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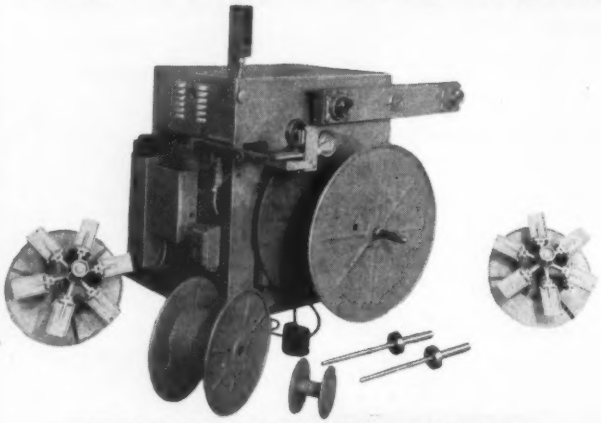
HULTGREN
SALT BATH FURNACES
Internally heated electric and gas-fired types

WRITE FOR AJAX CASE HISTORY BULLETINS ON: ☐ Patenting; ☐ Process Annealing; ☐ Descaling; ☐ Cleaning, Preheating, Fluxing.

AJAX ELECTRIC COMPANY 928 Frankford Ave., Philadelphia 23, Pa.

FOR FASTER — MORE UNIFORM WIRE PRODUCTION



DAVIS ELECTRIC CO. RE-SPOOLER AND COILER WITH INDEXING HEAD, MODEL CRS-1

1. Indexing head on top has interchangeable shaft feature to accommodate ⅝" up to 1¼" shafts or to your specifications. 2 Davis Collapsible Coiling heads can also be used. Reel sizes on indexing head up to 27" diameter.

EXCLUSIVE DESIGN FEATURES

2. Maximum production can be accomplished with indexing head — when spooling wire on reel or collapsing head operator can be packaging the reel or coil just finished.

3. Lower shaft will take reels up to 30" diameter, also has interchangeable shaft feature for 1¼" or 1½" diameter shafts or to your specifications.

4. Infinitely adjustable speed, adjustable width traverse synchronized with spooling speed for reels up to 16" traverse.

5. Electronic speed control with 10 to 1 range for wire speeds up to 1200 feet per minute, or higher if specified.

6. Adjustable Time Acceleration starts machine with low torque factor to avoid stretching and/or breaking of wire.

7. Electric disc brake for quick stopping of both upper and lower shafts.

8. External Tachgenerator can be supplied if desired for constant wire speed.

DAVIS ELECTRIC CO.
WALLINGFORD, CONNECTICUT

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RAM-TYPE TEFLON EXTRUDERS

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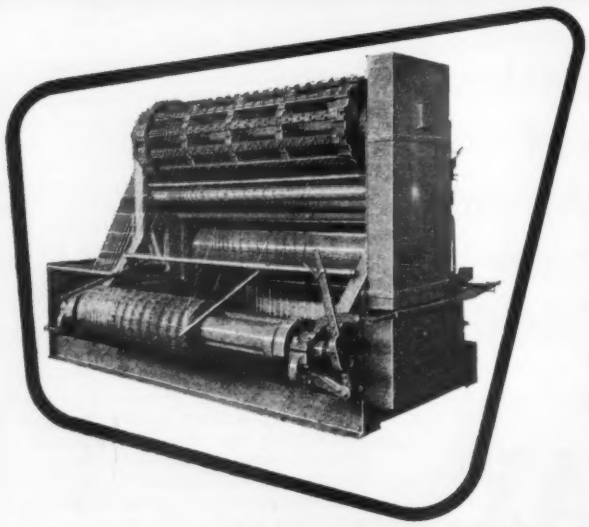

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SPECIALISTS IN FENCE LOOMS

Appointed were **F. R. Dallye,** product manager for electrical conductor accessories; **W. W. Knapp,** product manager for overhead transmission and distribution conductors; **D. H. Thayer,** product manager for building construction conductors; and **J. R. Woods,** product manager for power conductors.

* * *

Mr. Dallye will be located in Alcoa's Pittsburgh office; Messrs. Knapp, Thayer, and Woods will be located at Rome.

Ransohoff Appointments

R. C. Wigger, Executive Vice-President, the **Ransohoff Company,** Hamilton, Ohio recently announced the appointment of **Milton R. Watko** as Chief Engineer.

* * *

He obtained his engineering training at both Lawrence Institute of Technology, and Butler University before going to work as a consulting engineer on industrial finishing systems. He brings 15 years of experience in industral finishing to his new position.

* * *

Also, Harry L. Burnham, Sales Engineer, has joined the sales staff of the Company. For the past eleven years he has been associated with Phillips Manufacturing Co., Chicago, manufacturers of degreasing equipment. He was graduated from Hillyer College, Hartford University, Hartford, Connecticut.

Newman Advanced by Chase Brass

Clinton V. Newman has been promoted to Product Manager for rod and wire by **Chase Brass & Copper Co.,** a subsidiary of Kennecott Copper Corp., according to an announcement from **G. B. Moseley,** vice president - sales for Chase.

* * *

Mr. Newman is a graduate of the Missouri School of Mines. He has been an outside salesman assigned to the Chase district office in Detroit during the past six years, following broad experience in research and production operations at the firm's Cleveland, Ohio mills where he started in 1941.

Kaiser Aluminum Elects Ready to New Post

Thomas J. Ready, Jr., has been named Executive Vice President of **Kaiser Aluminum & Chemical Corporation,** it was announced today by **D. A. Rhoades,** president.

* * *

This new position was created by the board of directors because of the company's continuing growth and the broadening of its activities in many fields, in which Mr. Ready has been a key figure and largely responsible for the building, expansion and efficient operation of the company's facilities.

* * *

Mr. Ready had been serving as vice president and assistant general manager in charge of aluminum operations. He became asso-

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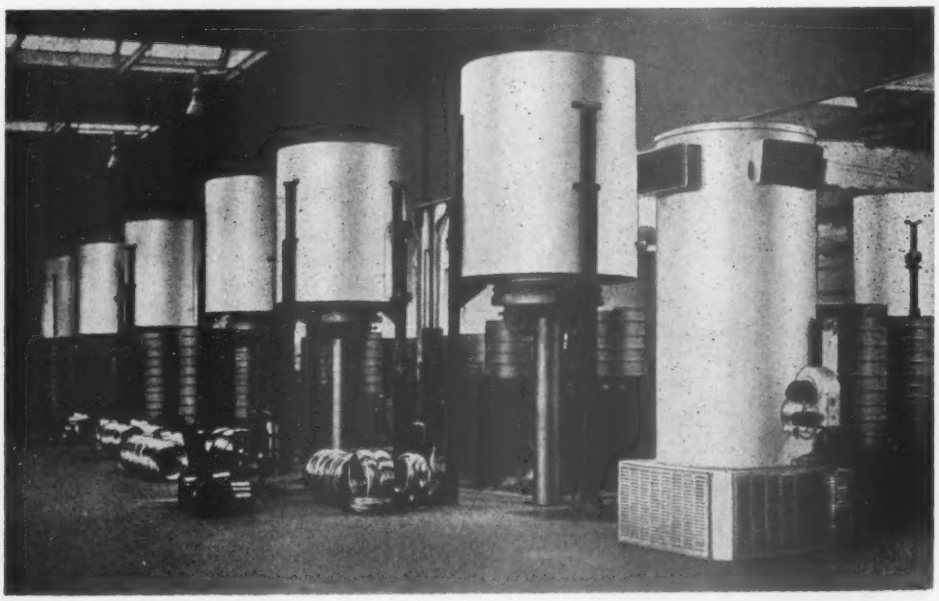

SEVERAL VACUUM BRIGHT ANNEALING UNITS WHICH WE HAVE INSTALLED IN ONE OF THE MOST PROMINENT CABLE WORKS IN GERMANY

(German and Foreign Patents)

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OFENBAU **FRITZ** G. m. b. H. & Co. K. G. **HAGEN,** (W.-GERMANY)

ciated with Kaiser in 1942 and served as assistant general sales manager and administrative assistant to the general manager of the Kaiser Co., Inc., Iron and Steel Division. When Kaiser Aluminum was formed in 1946, he joined the corporation as assistant general manager and became a vice president in 1950.

Page Announces Appointment

Richard S. Stonage has been appointed product manager for welding wire and stainless wire, according to an announcement made by **Joseph N. Kemple**, general manager, **Page Steel & Wire Division**, American Chain & Cable Company, Inc., Monessen, Pa. He succeeds **V. H. Godfrey**, who has retired.

U. S. I. Appoints Baltimore Manager

Albert C. Brooks has been named Manager of the Baltimore Sales Division for **U. S. Industrial Chemicals Co.**, Division of National Distillers and Chemical Corporation. **Alden R. Ludlow, Jr.**, Vice President in Charge of Sales, announced the appointment. Mr. Brooks succeeds **James F. Whitescarver** who has retired.

* * *

Mr. Brooks has been associated with U. S. I. for approximately 25 years, and his varied background of experience in the plant, in the laboratory and in sales make him well qualified to serve customers in the Baltimore Division. Mr. Brooks joined Baltimore Sales in 1940 and was Assistant Manager of the Baltimore Division when he was given his new assignment.

Silicone Products Department Appointments

Thomas S. Moroney has been appointed as a sales representative for the Cleveland District (Michigan Territory) of the **Silicone Products Department**, General Electric Company, Waterford, N. Y. His office location is 211 Woodward Avenue, Detroit 1, Mich.

* * *

Thomas H. Reilly has been appointed Sales Representative for the New England District of the Department. His office location is 145 North Beacon Street, Boston, Massachusetts.

* * *

Ted A. Venia has been appointed Sales Representative for the Eastern District of the Department. His office location is 1285 Boston Avenue, Bridgeport, Conn.

YS&T Appoints Market Analyst

Thomas G. Sanders has joined the **Youngstown Sheet and Tube Company** as market analyst in the commercial research department.

* * *

Coming to Youngstown from the U. S. Steel Corporation in Pittsburgh, where he served as product analyst, he is working on his masters degree in economics at Georgetown University. Educated in Washington, D.C., schools, the University of Maryland and the Georgetown School for Foreign Service, he served in various sections of the U. S. Department of

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BOONTON "PLASTISPOOLS" CAN BE ON THEIR WAY TO YOU WITHIN 48 HOURS

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Commerce as an analyst before entering private industry.

Smith Retires From National-Standard

After 35 years of association with the rubber industry, **K. D. Smith** has retired from active employment with **National-Standard Company.** He had been vice president of Rubber and Automotive Relations, and will continue to serve in an advisory capacity.

* * *

During his career, Mr. Smith, known throughout the industry as "K.D." was employed by the Miller Rubber Company, Syracuse Rubber Company, The Firestone Tire & Rubber Company, The B. F. Goodrich Company, and National-Standard Company. With National-Standard 15 years, he was located in their Akron office.

* * *

As a pioneer in rubber chemistry, Mr. Smith became well known as a tire construction engineer and wrote a number of papers on tire materials. He was instrumental in the development of low pressure tires. During World War II, he served in the U. S. Army Ordnance Department assigned to the development of synthetic tires.

Storrs Joins Carboloy's East-Central District

Appointment of **B. E. Storrs** to the post of service engineer with the East-Central District staff of the **Metallurgical Products Department** of General Electric in Cleveland has been announced by **Ray Parker,** Manager—Carbide sales. He formerly served as a marketing application engineering specialist with the Department.

* * *

A veteran of 22 years with General Electric, Mr. Storrs joined the company's Metallurgical Products Department in 1956 as a cutting tool specialist.

Welding Machine Firm Promotes Two Men

Two personnel promotions by **National Electric Welding Machines Co.,** have been announced by **Simon Fisher,** general manager of the Bay City, Mich., firm.

* * *

Paul Thorne, formerly chief electrical engineer, has been named chief electrical and development engineer to develop electronic applications in the building of automated welding machines. He will also be in charge of the laboratory and samples section.

* * *

Harold Bach, 20-year veteran with the company and former manager of the service and research section, has been named chief welding engineer.

Fred M. Crapo Suffers Serious Injuries

While on a business trip last November and being driven along an autobahn, the car in which **Fred M. Crapo,** President of **Indiana Steel and Wire Co.,** Muncie, Indiana, went out of control, struck an abutment, and threw Mr. Crapo out.

world wide sales...
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NORWAY
SWEDEN
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FRANCE
NORTHERN IRELAND
RHODESIA
INDIA
ENGLAND
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. . . indicate a world-wide reputation. Hanson & Edwards have supplied High Speed Tubular Stranding Machines to many of the most important Wire Rope and Cable factories throughout the world. These machines have rotors which run in large SPLIT ROLLER BEARINGS, not on support rollers, giving higher speeds, smoother running and lower maintenance costs
ROLLER BEARING TYPE
HIGH SPEED TUBULAR
STRANDING MACHINES
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P2035

We are sorry to report that Mr. Crapo, sustained painful and serious multiple injuries, although it is said that no basic organs were damaged.

* * *

He is reported to be doing well, but is likely to be confined to the hospital for some time to come.

* * *

Fred, a past and distinguished president of The Wire Association, will be happy to know that his many friends have learned of the accident with deepest concern and are hoping for his speedy recovery.

* * *

He is now a patient in Berufsgenossenschaftsspital, Duisburg-Buchholz, West Germany.

* * *

His family flew to Germany on receipt of the news and will remain there until he was recovered sufficiently to be moved.

Electric Wire Firm Moves

Philadelphia Insulated Wire Co., formerly located in Philadelphia, Pa., is moving into its new building on New Albany Road, in Moorestown, N. J., on September 15, 1959.

* * *

The company, which started out in 1820 as a manufacturer of wire frames for bonnets and hoop skirts, has erected a new, modern plant with a manufacturing area of 50,000 square feet. The building also will house its general offices for executive sales, engineering and customer service personnel. It makes a line of hook-up and multiconductor cables of various constructions, as well as manufacturing specialty wires to customers' specifications, and does a considerable amount of defense contract work.

Book of Papers on Hot Dip Galvanizing

The papers given at the Fifth International Conference on Hot Dip Galvanizing now have been published in book form.

* * *

These edited proceedings, considered authoritative, are grouped into 10 chapters, which cover: Pickling and Fluxing, Bath Heating, Galvanizing Processes, Strip Galvanizing, Painting of Galvanized Steel, Wire Galvanizing, Influence of Bath and Steel on Coatings, Testing of Coatings, Materials Handling, and Human Progress.

* * *

The papers, presented by 19 authors from eight countries, treat of the latest techniques of galvanizing. "Hot Dip Galvanizing, 1958," is priced at 63s ($9.00) per copy and may be ordered from the European General Galvanizers Association, 34 Berkley Square, London, W.i.

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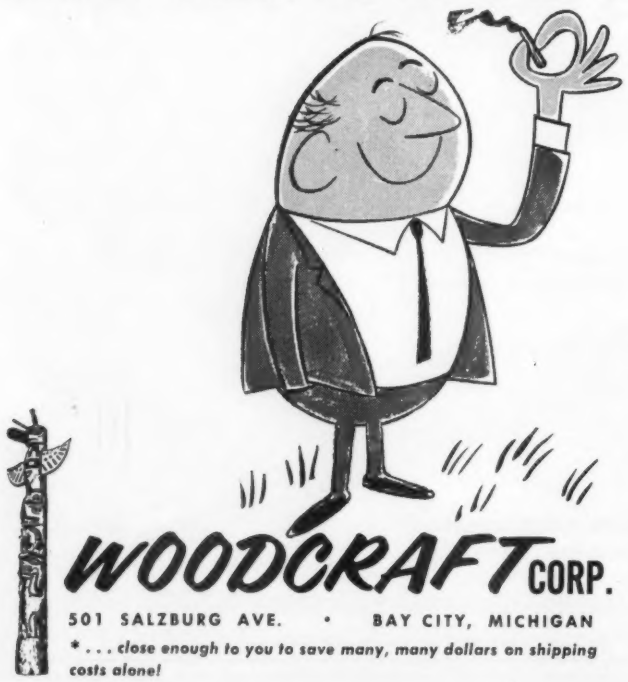
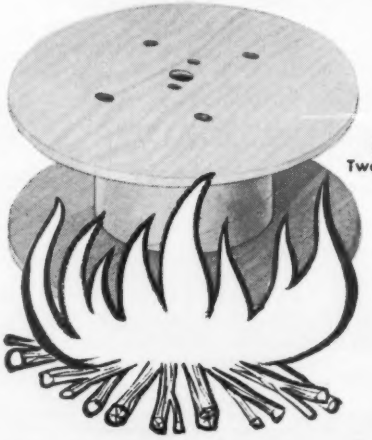


UP go your profits when you switch to *Woodcraft* disposable Reels & Spools. The reason: *Woodcraft Reels & Spools cost you less.* Why not *compare* the Woodcraft cost and prove to yourself how many dollars *you* can save.* Available in all sizes, and specifications . . . *without price penalties.*



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A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,910,749, SPRING CLIPS, patented November 3, 1959 by William H. Parker, Philadelphia, Pa.

The clips are constructed wholly of wire spring coils and wire jaws.

* * *

No. 2,910,822, APPARATUS FOR WRAPPING STRAND MATERIAL HELICALLY ABOUT AN ADVANCING CORE, patented November 3, 1959 by Tillman T. Bunch, near Ashland, Baltimore, County, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

This apparatus includes a rotary wire applicator having a bore through which the core advances and a circumferential lip extending around the bore at that end of the applicator which the core enters with the applicator mounted in such a position with respect to the strand supply that the strand withdrawing from the supply advances in a direction having a component opposite to the direction of advancement of the core, passes about the lip and then enters the bore.

* * *

No. 2,910,823, STRAND TWISTING APPARATUS, patented November 3, 1959 by Tillman T. Bunch, near Ashland, Baltimore County, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A hoop is mounted concentrically with respect to the rotational axis of a loop-carrying flyer and is rotated in synchronism with the rotational flyer with an antifriction device mounted on the hoop engaging the strand loop and restraining the ballooning thereof.

* * *

No. 2,911,014, WIRE CRIMPING APPARATUS, patented November 3, 1959 by Arden L. Van Nest, Indianapolis, Ind., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Apparatus is disclosed for crimping a wire about each prong in a row of aligned, parallel prongs, which includes a frame having a support for the prongs. Six claims.

* * *

No. 2,911,865, APPARATUS FOR MAKING FORMED WIRE, patented November 10, 1959 by Alan E. Brickman, Williamsville, N. Y., assignor to United States Steel Corporation, a corporation of New Jersey.

More specifically the apparatus is for forming pinched ears on a rod or wire at intervals along the length of the wire. The application resulting in this patent is a continuation-in-part of the application maturing in patent 2,780,860, dated Feb. 12, 1957.

* * *

No. 2,912,099, AUTOMATIC WIRE-TYING MACHINE, patented November 10, 1959 by Shirley B. Brouse, Chicago, and Paul W. Fawcett, Western Springs, Ill., assignors to United States Steel Corporation, a corporation of New Jersey.

It is stated that this is an improvement upon the machine of patent 2,416,-859 and relates to a device for feeding the wire around a guide track and subsequently pulling it therefrom into initial engagement with a package.

* * *

No. 2,912,133, RUBBISH BURNER, patented November 10, 1959 by Joseph J. Adrian, Somonauk, Ill.

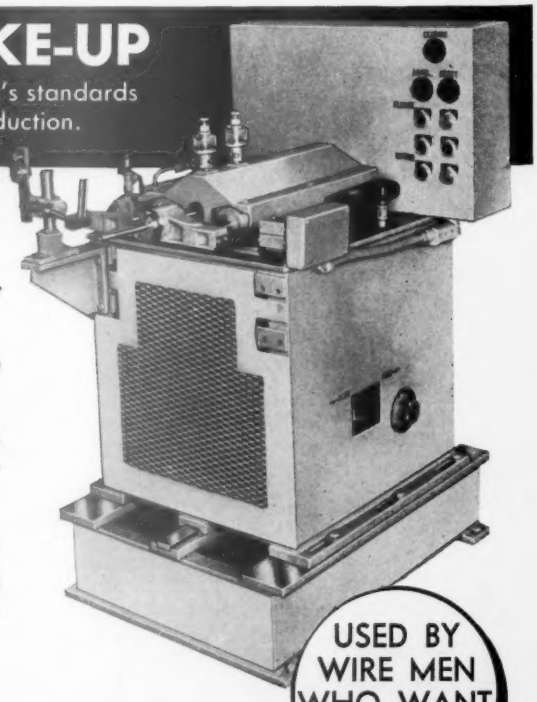
The receptacle and closure are of helically wound wire with the convolutions of the receptacle having V-shaped portions in the convolutions disposed about wire uprights.

* * *

No. 2,912,177, COIL - WINDING MACHINE, patented November 10, 1959 by John Anderson Oram and Herbert John Sherry, Aylesbury, England, assignors to Link Aviation, Inc., Binghamton, N. Y., a corporation of New York.

Sjogren FLAT WIRE TAKE-UP

This new SJOGREN machine is designed to meet today's standards for trouble-free operation and long-run wire mill production.



FEATURES INCLUDE:

SPEED — Presently running 650 fpm.

CAPACITY — 25 pound maximum capacity spool. (Similar models for heavier capacity).

TRAVERSE — Hydraulic spool traverse is infinitely adjustable from zero to 5/8" per rpm of spool.

TENSION — When placed directly behind flattening mill, constant tension is maintained through a Louis-Allis eddy current clutch type motor.

STARTING — Forced acceleration circuit prevents slack wire.

BASE — Machined so that top unit may be moved to compensate for wear on the flattening mill roll.

USED BY WIRE MEN WHO WANT THE BEST!

Sjogren TOOL & MACHINE CO., INC. 14 Sword St. AUBURN, MASS.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • GAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

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DIJON FRANCE

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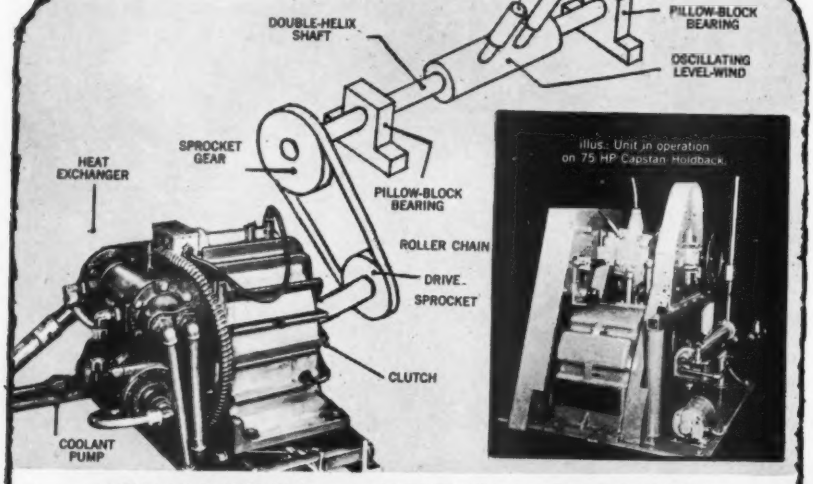
ROUTE DE TROYES



FOR TENSION AND SPOOLING CONTROLS

Tensolite, Anaconda, Plastoid, National Standard, Johnson Steel & Wire, Pittsburgh Steel, Boston Insulated Wire, Worcester Wire and a host of other wire producers found out that for successful Spooling, Drawing, Coating, Tinning, Heat Treating, etc. THERE IS NO EQUAL TO THE 'FRANKEL' WINDING SYSTEM.

Visit our booth 407 — 1959 Design Engineering Show
Convention Hall, Philadelphia May 25-28

Proven Best For Web & Filament Machinery Since 1934

WEB CONTROLS CORP.

318-22 Briarcliffe Road, West Englewood, N. J.

This machine is adapted to wind a coil of wire on a card.

* * *

No. 2,912,910, BEACH LANDING MAT, patented November 17, 1959 by Allen B. Wilson, Chicago, Rufus Dale Kaiser, Oak Park, and Bestor P. Coleman, Willow Springs, Ill., assignors to Acme Steel Company, Chicago, Ill., a corporation of Illinois

The method of forming the mat of parallel longitudinal thin metal strips and parallel transverse thin metal strips, comprises the steps of forming apertures in the longitudinal strips, forming a pair of tongues on each longitudinal strip on opposite sides of each aperture, deflecting the tongues of each pair on opposite directions from the plane of the attached strip to enlarge the intervening aperture, forming hooks on the ends of the traverse strips, and inserting one of the hooks through each enlarged aperture and into engagement with one of the tongues to retain the hook in pivotal engagement therewith.

* * *

No. 2,913,014, WIRE SLEEVING APPARATUS, patented November 17, 1959 by Horace Walter White, Kidderminster, England, assignor to The National Standard Company, Limited, Kidderminster, England, a British company.

An automatic machine is disclosed for securing a tubular sleeve to the end of a wire.

* * *

No. 2,913,015, WIRE TYING DEVICE, patented November 17, 1959 by Gerald Waterworth Cafferata, Epperstone, England, assignor to The British Plaster Board Limited, Wallasey, Cheshire, England, and Gyproc Products Limited, Westfield, Kent, England, both companies of Great Britain.

This is a hand tool for tying a wire tie having straight plain ends.

* * *

No. 2,913,098, CORE-LOADER FOR WINDING MACHINE, patented November 17, 1959 by Robert V. Zellinsky and Glenn L. Jorn, Seattle, Washington, assignors to Western Gear Corp., Seattle, Wash., a corporation of Washington.

The loader is adapted for use with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station.

* * *

No. 2,913,158, GARMENT RETAINING MEANS FOR METAL WIRE COAT HANGERS, patented November 17, 1959 by Louis S. Reller and Lucille S. Reller, Washington, Iowa.

A garment hanger is disclosed, substantially all of bent wire and provided with strap holding clips.

* * *

No. 2,914,228, GARMENT HANGERS, patented November 24, 1959 by Leon H. Zeuthen, Minneapolis, Minn.

This is a wire hanger with doubled over reinforcing portions, also of wire.

* * *

No. 2,914,262, POTENTIOMETER COIL WINDING MACHINE, patented November 24, 1959 by Leonard E. Ludvigsen, Montebello, Calif.

Associated with a rotating mandrel is a pitch guide having a hole for receiv-

ing the mandrel and a slot extending from the hole to receive the wire, with a sensing shoe disposed against the pitch guide with a particular pressure to control the spacing of the turns of wire on the mandrel, there being also means including servomechanism means for regulating the pressure of the shoe against the pitch guide at the particular pressure.

* * *

No. 2,914,643, WIRE FEEDER MECHANISM, patented November 24, 1959, by Lester E. Fields, Waban, and Michael E. Willdorf, Malden, Mass., assignors to Hy-Sil Manufacturing Company, Revere, Mass., a corporation of Massachusetts.

The mechanism is adapted for notching a wire and directing it onto a heater element in a vacuum evaporation system. Eight claims.

New Catalog on Cleaning and Coating

A new 40-page catalog on machinery and machinery systems for metal surface processing (cleaning, washing, rinsing, drying, and spraying, flow and dip coating) is now available from the **Ransohoff Company,** Hamilton, Ohio.

* * *

The publication illustrates and describes Ransohoff-designed drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, Ransomatics, and complete automatic finishing systems. A section is devoted to custom-engineered finishing systems.

* * *

Included in the catalog are separate sections on foundry mills, customized large capacity barrel finishing equipment, ultrasonic cleaning equipment, and special machinery; such as, vertical washers designed for plants where floor space is at a premium.

* * *

Copies may be secured by writing the company.

Dodge Fibers Appoints Sales Agent

Dodge Fibers Corporation, Hoosick Falls, N. Y., has announced the appointment of the **Russ Diethert Co., Inc.,** 2030 West Montrose Ave., Chicago, Ill., to represent them in Wisconsin, Illinois, Indiana, North and South Carolina, Tennessee, and Tazwell Co., Virginia.

* * *

HEAVY COIL WRAPPING MADE EASY WITH LARMUTH'S NEW 12" MACHINE

Now Glues The Paper As It Wraps

12" MACHINE

A LARMUTH *Spiral Wrapping* MACHINE

WITH PATENT MECHANICAL LOADING AND EJECTION

FOR COILS UP TO 12" WIDE

PUSH BUTTON CONTROLLED

LARMUTH *of England*

U.S.A. Agents: Machinery & Machine Supplies Co., Inc.
305 East 47th St.,
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Telephone: Plaza 8-0744-5-6-7

LARMUTH (1947) LTD., BROOK STREET, KNUTSFORD, CHESHIRE, ENGLAND
Telephone: Knutsford 2244/5

AT YOUR SERVICE

*

SPECIALIZED ENGINEERING
SPECIALIZED EXPERIENCE
SPECIALIZED MACHINERY
FOR
TWISTING • STRANDING • BUNCHING
Continuous Tension Control
For Precision-Quality

*

HASKELL-DAWES
MACHINE CO., INC.
2231 E. Ontario Street
Philadelphia 34, Pa.

CAMDEN WIRE CO., INC.

Wire Fabricators

PRODUCERS OF QUALITY FINE WIRE
COPPER CONDUCTORS

SOLID • BUNCHED • STRANDED
OR BRAID

BARE • TIN OR LEAD COATED
AND SILVER PLATED

"Prebond"

CAMDEN WIRE CO., INC.
40 MASONIC AVENUE • CAMDEN, NEW YORK

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VICTOR LINÉ

of Albert (Somme) France

Originators Of The Famous LINÉ-GORCY Rod Descalers
(Over 2000 now operating in 28 countries of the world)

Proudly Announce
Their

NEW DC-1-A & DC-2-A
MECHANICAL ROD *DESCALERS*

For Cleaning Hot Rolled Wire Rods
up to 5/8-inch Diameter incl.

New Features —

Lubrication of *Bearings*—permanent—sealed

Increased efficiency—Motor driven brushes

Newly designed hard-faced *Roller* units

Easier *Threading* and easier *Maintenance*

With these Superior Machines
MECHANICAL DESCALING of WIRE RODS
—Takes a Giant Step Forward

Write to: FISHER ASSOCIATES 122 E. 42nd St., New York 17, N. Y.

The company has sales offices at convenient points in the areas served and will be calling on wire and cable and electrical manufacturing companies on the Dodge line of Teflon coated glass yarns and tapes.

"Grits and Grinds" Fifty Years Old

The Norton Company, Worcester 6, Mass., has published the 50th Anniversary issue of "Grits and Grinds", a technical publication started by it in 1909, dedicated to better grinding, lapping and surface finishing. The issue is No. 6, 1959.

* * *

It is principally devoted to a history of the publication, interspersed with company developments, achievements, leadership. The article, written by **E. T. Larson,** Editor, entitled "A Backward Glance — and a Forward Look," is an excellent presentation of the Norton and the "Grits and Grinds" story.

New Sunbeam Furnace Bulletins

Since the **Sunbeam Equipment Corporation** purchased the Westinghouse industrial furnace business, a new series of bulletins have been issued, which are available upon request.

* * *

They are:

No. SEC-G1 — Atmosphere Generators, a 20-page bulletin covering the complete line of protective atmosphere generators.

No. SEC-2 — Bell Type Furnaces, an 8-page bulletin on the company's gas-fired and electric bell-type furnaces.

No. SEC-3 — Box Type Furnaces. Describes their box-type electric furnaces. 12 pages.

No. SEC-4 — Box Type Furnaces. 12 pages of text and illustrations on Sunbeam box-type fuel-fired furnaces.

No. SEC-5 — Pot Type Furnaces. A 20-page bulletin on the complete line of electric and fuel-fired pot furnaces.

* * *

For copies, write Sunbeam Equipment Corp., 180 Mercer St., Meadville, Pa.

Returnable Reel Standards

National Electrical Manufacturers Association, 155 E. 44th St., New York 17, N. Y., has published NEMA Standard WC 20-1959, covering returnable Reel Dimensions for Wires and Cables.

* * *

This standard covers returnable wood, wood and metal, and all-metal reels used in processing and shipping wire and cable. It establishes reel sizes designed to provide strength, holding capacity, and steps between sizes. Copies may be ordered at 25 cents each.

Automatic Brazing and Soldering

The Eisler Engineering Co., 750 So. 13th Ave., Newark 3, N. J., has issued a new catalog on its automatic brazing and soldering machines of the continuous running and indexing types. These include over 100 different types and special machines are made to order. For a copy of the catalog, please write the company.

Bulletin on Polyethylene Line Wire Covering

A new Technical Data bulletin just released by **U. S. Industrial Chemicals Co.** outlines the benefits inherent in **Petrothene*** polyethylene for line wire covering. The new bulletin compares polyethylene, neoprene and URC, for their various properties in line wire covering applications.

* * *

Tables present average mechanical properties such as tensile strength, tear resistance, abrasion resistance, etc., for polyethylene and neoprene, and give the nominal weights of finished weather-resistant wire and cable in lbs. per 1,000 ft. of wire.

* * *

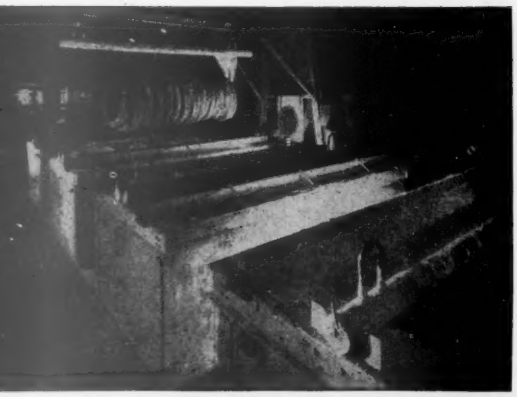
Copies of the Technical Data bulletin, "Polyethylene . . . The Best Line Wire Covering," are available upon request to U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

*Registered Trademark

New Wire Plant in Elizabeth

Great Eastern Wire Corp., has announced that its new plant at

carl mayer
HI-SPEED REGISTERED ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

American Steel & Wire Co.
Atlas Steel Co.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America
Driver-Harris Co.
B. Greening Wire Co., Ltd.
Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

Write for Bulletin No. 350

Patent Nos.
U. S. A. 2,296,361
2,323,828
2,235,559
Canada 396,144
401,389

THE carl mayer CORP.
20800 CENTER RIDGE RD., CLEVELAND 16, OHIO
OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

EQUIPMENT
Extruders
Takeup Equipment
Payoff Equipment
Spoolers
Respoolers
Measuring Machines
Capstans
Cable Strippers
Braiding Equipment
Twinners, Stranders, Cablers, Bunchers
Spark Testers
Printing Machines
Spiral Striping Machinery
Taping Equipment
Fine Wire Takeup and Respooling Equipment
Wire Drawing Machines
Specially Built Equipment
And Much More

SUPPLIES
Wire Drawing Dies
Wire Drawing Spools
All Types of Reels and Spools
Lithographed Spools
Inks for Printing Machines
Bare, Tinned and Silver Plated Copper Wire, Stainless Steel, Silver, Nickel, Bronze, Brass and Other Bare Wires
Numerous Other Items

all the wire industry in the West looks to 2 companies

First, there's Western Wire & Textile Machinery, Inc., the only company in the West that deals exclusively in used and reconditioned wire and cable-making equipment.

Secondly, there's the Paul I. Kenner Co., supplier and distributor of new wire and cable manufacturing machinery and supplies.

Nowhere else in the West will you have a better chance of finding exactly what you need---either new or used. Nowhere else in the West will you be able to trade in old equipment on new. Nowhere in the West will you find such a complete stock of machinery and equipment.

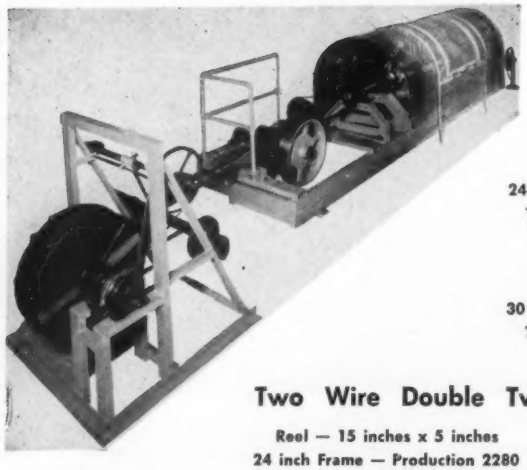
You'll like dealing with men who speak your business language---with companies backed by 20 years of highly specialized experience.

SOME EQUIPMENT ON HAND:
Takeups • Payoffs • Braiders • Asbestos Carding Lines • Taping Machines • 13 Die Copper Rod Breakdown Machine with Cook M-1000 Spooler Takeup.

2 Two companies that provide all that's needed, new and used for the West's wire industry.

WESTERN WIRE & TEXTILE MACHINERY, INC.
228 Shaw Road South San Francisco, Calif. Tel.: JUno 9-1101

PAUL I. KENNER CO.
228 Shaw Road South San Francisco, Calif. Tel.: JUno 9-1101



TWO WIRE
SINGLE TWIST
TWINNING MACHINE

— Reel 24 inches x 16 inches
24 inch Frame — Production — 1140
Twists per minute — Power 3 H.P.

•

Reel — 30 inches x 16 inches
30 inch Frame — Production — 1000
Twists per minute — Power 3 H.P.

Two Wire Double Twist Twinning Machine

Reel — 15 inches x 5 inches
24 inch Frame — Production 2280
Twists per minute — Power 3 H.P.

Reel — 24 inches x 12 inches
30 inch Frame — Production 2000
Twists per minute — Power 5 H.P.

All Double Twist Machines are equipped with our Patented Constant Tension Over Run Prevention Devices. Take-Ups are engineered to run with these high speed machines and have tensions which can be quickly adjusted while in operation and Over Run Prevention Devices eliminating wire draw down on stopping.

All machines have Open Sided Capstans and Quick Loading Cradles for high production and ease of operation.

FOR COMPLETE DETAILS WRITE OR WIRE

THE EDMANDS COMPANY

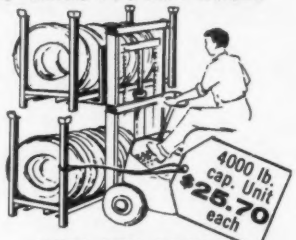
860 Wellington Ave. Cranston 10, R. I.

JARKE MODULAR STORAGE SYSTEMS

Increase Storage Efficiency . . . Save Time . . . Cut Costs

For Permanent Or Temporary Storage

Jarke Mini-Modules give you storage when you want it, where you want it. Easily set up or taken down, no bolts, no tools, no fittings. Special "nesting" caps provide fast stacking and insure rigid, no-slip interlocking tiers. Sturdy steel construction. Lightweight. Four standard sizes. Send for details now!



WIRE COIL RACKS

Designed for stacking coiled material, these racks have four-way entry for fork truck, open ends for ram-type deposit of coils. Nesting caps insure fast easy stacking. Heavy-duty steel construction.

PORTABLE BAR RACKS

Unique crane grab permits load centering and rapid fool-proof engagement. Automatic grab also available. Assorted standard sizes. Specials to order.

JARKE MANUFACTURING COMPANY
6333 Howard St.
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MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

795 Trumbull St., Elizabeth, N. J., will be opened on or about October 1, 1959.

* * *

The plant, a one-story, modern building, is designed to keep material handling costs at a minimum. High speed wire drawing and auxiliary equipment have been installed for the manufacture of round, shaped and straightened and cut steel wire at an estimated rate of 1200 tons per month in sizes ranging from .625" down to .005".

* * *

A technical staff and research department will be available to assist wire users to select the proper wire for end products. The company is headed by Frank W. Golembeske, who is a member of The Wire Association.

Symposium on Quality Control

The Sixth National Symposium on Reliability and Quality Control in Electronics will be held in the Statler Hilton Hotel, Washington, D. C., from January 11 through 16, 1960, according to an announcement made by **E. F. Jahr,** Chairman of the Publicity Committee.

* * *

Participating societies will be The Institute of Radio Engineers, American Society for Quality Control, Electronic Industries Association, and American Institute of Electrical Engineers.

New Bulletin on Silicone Rubber for Wire

A new bulletin featuring General Electric silicone rubber for lead wire insulation is now available from the **Silicone Products Department,** General Electric Co., Waterford, N. Y. Designated as CDS-179, this four-page bulletin illustrates how silicone rubber offers long-term service life by maintaining excellent insulating properties for prolonged operating periods and over a wide range of temperatures.

* * *

This publication also offers a comparison between silicone rubber, polyvinyl chloride, neoprene and natural rubber, as insulating materials. Included in this com-

START SAVING in your Die Finishing Rooms

•

Double your Refinished Tungsten Carbide Die Production CUT labor costs 1/2 with the New Type "M" automatic

DYKREX
"IT CORRECTS THE DIE"

Polishing Machine

It's factory assembled—just plug it in to nearest electric outlet.

ROOS TOOL & MFG. DIVISION
Dykrex Corporation of America
manufacturers of
Wire Die Finishing Machinery
17-19 Grove Street
Montclair, N. J.
Phone: PI lgrim 4-1500

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Chicago 32, Ill.

GLEN CARBIDE, INC.
704 Second Avenue
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SANCLIFF, INC.
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Western Union
Teletype Service
QAB-FAX—Montclair, N. J.

The Standard of the Wire Industry

parison are maximum operating temperatures, physical and electrical properties and degrees of chemical resistance.

Bulletin Describes Forming, Stamping and Assembly Facilities

Facilities for wire and strip metal forming, stampings, and assemblies are described and illustrated in a new data sheet just published by the **Hunter Spring Co.** Illustrated with photographs of typical parts, the data sheet lists maximum dimensions of work that can be formed.

* * *

Bulletin 601b is available on request from the Hunter Spring Co., a Division of American Machine and Metals, Inc., 1 Spring Ave., Lansdale, Pa.

Ames Forms Weld Press Division

Ames Spot Welder Co. Inc., Rego Park 74, N. Y., has incorporated its engineering activities into a new division, to give attention to the special needs and requirements of the wire, tubular and metal product manufacturers.

* * *

The Weld Press has been specifically designed for spot welding unlimited number of spots over large areas simultaneously. It can be installed on any power line, regardless of power supply limitations. Quick change features allow for economical short runs.

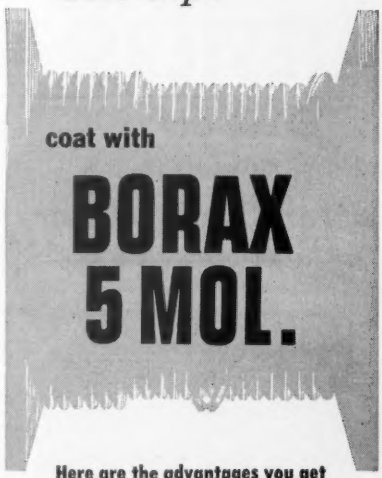
* * *

Sidney Schwartz, President and Sales Manager, said the firm is increasing engineering personnel to intensify research for varied customer requirements for resistance welding applications.

Electric Wire Firm Changes Name

Robert H. Davies, President of **The Electric Autolite Co.,** Toledo, has announced that the company has changed its name, spelling "Autolite" without a hyphen. The change is occasioned by the diversification of the company's products into fields outside of the automotive industry, for which originally it only manufactured products.

Six *advantages from just* One *dip!*



Here are the advantages you get when your stock is Borax-coated...

1. GOOD ACID NEUTRALIZING
2. LONGER DIE LIFE
3. FASTER BUTT WELDING
4. BETTER WORKING CONDITIONS
5. LONGER STORAGE WITH SAFETY
6. RUST DOES NOT FORM

One dip puts on a Borax coat that is tight, yet pliable, and dries in a few minutes. It provides a good vehicle for your drawing lubricant and won't flake off. Borax-coated rods are a lot cleaner to handle in transit and are protected from rust while in storage. Try BORAX or BORAX 5 MOL on *your* stock!

Write to our Technical Department for further information

United States Borax & Chemical Corporation

PACIFIC COAST BORAX COMPANY DIVISION

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630 Shatto Place, Los Angeles 5, Calif.

Los Angeles Chicago Philadelphia
New York St. Louis Cleveland
Atlanta

LOW-COST SPARK TESTERS!

New Enjaco Economy Line Offers Quality at the Best Prices Ever!

Class R, Type R-5 Re-Reeling Sparker with Patch Test Circuit, **$295**

Class RE, Type RE-5 Extruder Sparker with No-Spark Circuit. Fault Counter optional. **$325**

Features include "Controlled Power" 10-milliampere secondary current for safety, and Electronic Fault Circuit. Available in models up to 15,000 V., A.C.

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Phone HOpkins 7-8411
Cable "Jalenco" Providence

Proceedings of the Annual Convention of The Wire Association

(*Continued from page* 87)

you have your vacuum, why, you are in operation.

One of the other advantages, I believe, is that it will be cheaper. I am quite certain it will be cheaper than hydrogen furnished from bottles, which is quite expensive.

To prevent this nitrogen pickup you must anneal in this vacuum or go to hydrogen atmosphere. The pickup is in atmospheres such as disassociated ammonia.

A lot of people believe that this nitrogen pickup is due to the residuum in disassociated ammonia atmosphere, but we have proven that this isn't the case. We have proved that when the residual is completely stripped from the disassociated ammonia we still have nitrogen pickup, so we must either anneal then in a hydrogen atmosphere or vacuum.

We have been very successful in annealing the 300 Series with pressures up as high as 50 microns. Now in this continuous operation, if the strip is clean, we can maintain a vacuum pressure between 6 and 10 microns. If the lubricant or the rolling oil is allowed to enter the vacuum furnace, then that pressure might well go up to 50 microns.

In the 400 Series we feel it is a little more difficult to anneal. We feel that this pressure should be 10 microns, or under.

Now, there is a disadvantage of the mercury seals. We must avoid materials which are susceptible to stress corrosion. For example, we started out annealing titanium and we had wonderful success at the start, and we looked around, and in 10 or 15 minutes a strip had broken in two. You can take a piece of titanium, straight titanium alloy, and apply a little stress to it and it just breaks off right now.

Another thing that limits your mercury seal is that it must be a material that doesn't amalgamate with your mercury.

CHAIRMAN SCHMID: Thank you very much, Mr. Perrine. That was very good; something new that I am sure no one has heard about.

Are there any of these furnaces actually in production yet?

MR. PERRINE: Only as a pilot line in our laboratory, which we can demonstrate.

CHAIRMAN SCHMID: And would you run samples for them?

MR. PERRINE: We can.

CHAIRMAN SCHMID: What is the maximum temperature of that pilot line?

MR. PERRINE: We have straight nickel-chrome grids in it and we will go up to 2,000° F. That is the maximum. If you use molybdenum you can go up to much higher temperatures.

CHAIRMAN SCHMID: Gentlemen, any questions?

If not, we stand adjourned.

TO SELL—ADVERTISE IN WIRE AND WIRE PRODUCTS

It pays—send for rates
453 Main St., Stamford, Conn.

DOUBLE ROLLING-MILL,

electric-driven, rollers 2.½" x 5.¼" long, for sheets ¾" to 1/128", for wires 5/16" to 1/25", as illustrated, special price net U. S. $1060. — CIF. U. S. — seaport, complete, ready for use. Weight 495 lbs. Also hand-driven rolling-mills, foot-pedal — and hand lever presses, finger- ring- enlarging machines. Ask for offer!

T. H. ROHRS AGENT
26 COURT ST., BROOKLYN-1, N. Y.

You are Invited To Join

THE WIRE ASSOCIATION

Send for booklet describing its activities and a membership application card.

453 Main St. Stamford, Conn.

The Story of the Annual Convention of The Wire Association

(*Continued from page 59*)

men. The Annual Convention in 1959 was no exception. These people, to whom all credit must be accorded for this highly successful meeting, were:

GENERAL PROGRAM CHAIRMAN

Walter B. McShane
Chairman, Wire Committee
American Steel & Wire Div.,
U. S. Steel Corp.
Cleveland, Ohio

FERROUS DIVISION

Chairman
Gordon T. Spare, Res. Proj. Eng.
American Steel & Wire Div.
United States Steel Corp.

MEMBERS

Carleton W. Garrett, Met. Eng.
Jones & Laughlin Steel Corp.
Howard J. Godfrey, Asst. Chf. Eng.
Research & Development
John A. Roebling's Sons Corp.
W. R. Miller, Chief Met. Eng.
American Steel & Wire Div.
United States Steel Corp.
E. W. Rainey, Metallurgist
Northwestern Steel & Wire Co.

NON-FERROUS DIVISION

(Bare Wire Section)
Chairman
David M. Schmid, Pres.
Techalloy Co., Inc.

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Copper Div., Walker Bros.
Charles L. Kessler, Chf. Wks. Met.
Aluminum Company of America
Henry McConnell, Wire Plant Mgr.
Sylvania Electric Products, Inc.
W. R. Moyers, Chf. Wire Eng. Dept.
Western Electric Company
H. Clark Smith, Jr., Vice Pres.
Research & Engineering
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* * *

Those who convened in Cleveland in October can be grateful to these men for the fine quality of papers and the many other program details for which they were

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Open hearth grades from low metalloid through high carbon, Thomas grades, cold heading and special grades for sensitive applications. Heavy coils up to 880 lbs.—I.D. up to 33½". Sizes from .200" to ¾".

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Knitted or Curled, Round or Flattened Wire of Copper or Bronze - Coated with Silver or Brass
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SMOOTH SPOOL HEADS will not break, warp, knick or rough-up—reducing maintenance costs. The instant locking feature saves time locating "dog-hole". Lighter than metal spools with less wear on Braider and Winder.
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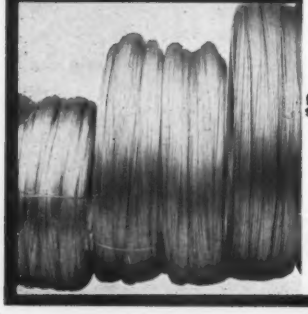
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Dia: 0.324″ ~ 0.0016″
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NIPPON STAINLESS STEEL WIRE MFG. CO., LTD.
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responsible. The Board of Directors have formally recorded their appreciation and thanks to Mr. McShane and his Committeemen and the results of their efforts will be remembered as an achievement that other committees well can endeavor to emulate.

Symposia Papers on Galvanizing Published in Book Form

The edited proceedings of the Benelux Conference in Brussels on Hot Dip Galvanizing, held in 1958 by the European General Galvanizers Association, contains 20 papers on various phases of galvanizing from pickling to human considerations. Several are devoted specifically to wire and strip galvanizing.

* * *

The papers, representing the latest ideas of technicians in eight countries, have taken their place as part of the authoritative literature on the subject. They are grouped in ten chapters and cover 356 pages of text.

* * *

Copies of the book "Hot Dip Galvanizing 1958", may be procured from Secretariat, **Zinc Development Association,** 34 Berkeley Square, London, W. 1, England, at a cost of 63 S ($9.00) each.

Colored Steel Wire Announced

Wire products in color are now available, it was announced by **H. N. Goettlich,** president of **Appalachian Steel Corp.,** Lyndhurst, N. J.

* * *

This, an innovation in the wire industry, has been achieved by a new process that provides 18 to 24 gauge wire in white, red, deep blue, bronze-gold and green for the manufacture of paper clips, spiral book binding, floral packaging, metal displays and other numerous commodities where the use of color is advantageous. Appalachian Steel will market the product under the trade name of "Appalsteel".

Our Advertisers are Reliable Patronize Them

The Manufacture of Precision Cold Drawn Shaped Wire

(*Continued from page* 53)

2) **A little of the past history of shaped wire manufacture.**
3) **The atmosphere surrounding the operation on the shop floor conducive to meticulous workmanship.**
4) **Our subject material's competitive status with competing materials and methods.**
5) **Designing the die and drafting the work.**
6) **The making of the die and the methods of machining carbide.**
7) **Pointing and drawing the wire.**
8) **Heat treatment.**
9) **Inspection.**

* * *

Seemingly small insignificant details have been **deliberately** mentioned — this is really necessary because it is these **apparently insignificant** details which combine to give satisfactory results.

* * *

This is one of the most fascinating sections of our industry, a section although small in the weight of finished wire produced compared with overall round wire tonnage, **yet of major importance,** a section giving an important **cost saving** contribution to the precision metal working industries.

* * *

Here is a trade in which teamwork in the factory plays a major part from the draughtsman, metallurgist, toolmaker, ancilliary process worker, wiredrawer and inspector — this is not a trade, as one can readily see, where one can go into business by simply buying a machine, hiring an operator and starting to operate from a book of instructions.

* * *

In these days of near automation in the round wire business it is indeed a pleasure to acknowledge the **skill** of all those employed in the Precision Cold Drawn Shaped Wire Industry in whatever plant they practice their trade.

* * *

References:

1) **American Machinist (Rathbone) Oct 6th 1951.**
2) **Stahl u Eisen (Dr. Ing. Herman Preussler) Nov 10th 1949.**
3) **Wire and Wire Products (Vitelli) October 1953.**

COMING WIRE ASSOCIATION MEETINGS

May 4-5, 1960, Sheraton Hotel, Philadelphia, Pa. — Regional Meeting of Electric Wire & Cable Section

June 8-9, 1960, Statler Hilton Hotel, Los Angeles, Cal. — Pacific Coast Regional Meeting

November 14-17, 1960, La Salle Hotel, Chicago, Ill. — The Annual Convention — All Divisions

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Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
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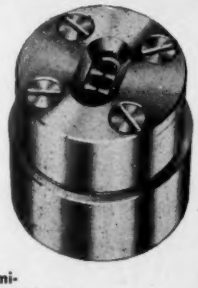

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New Standards Available

Two new standard recommendations of the International Electrotechnical Commission are available from the American Standards Association.

* * *

They are IEC Publication 111, Recommendation for the Resistivity of Commercial Hard-Drawn Aluminum Electrical Conductor Wire, and IEC Publication 114, Recommendation for Heat-Treated Aluminum Alloy Busbar Material of the Aluminum-Magnesium-Silicon Type.

* * *

Publication 111 sets the value of resistivity of commercial hard-drawn aluminum electrical conductor wire for international use.

* * *

Publication 114 prescribes the electrical and mechanical properties of the busbar material specified in the title.

* * *

The IEC was founded in 1904 to establish voluntary world-wide standards in the electrical and electronics field. American interests in IEC work are represented by the U. S. National Committee of the IEC, an arm of the American Standards Association.

* * *

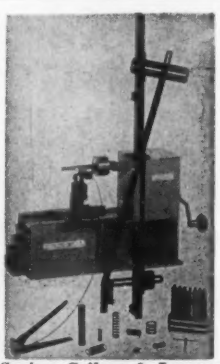
Copies of IEC Publications 111 and 114 are available at 80 cents each from the **American Standards Association,** Dept PR 102, 70 East 45th Street, New York 17, N. Y.

Kanthal Plans Expansion

The Kanthal Corporation, manufacturers of electric resistance alloy wires, has purchased a 21 acre piece of land on Wooster Street, Bethel, Conn., on which it plans to erect a modern 150,000 square foot plant.

* * *

General offices and fine wire operations will be continued at the present location at Amelia Place, Stamford, Conn., and the new facilities, expected to be in operation next Spring, will be devoted to the production of larger gauge wires.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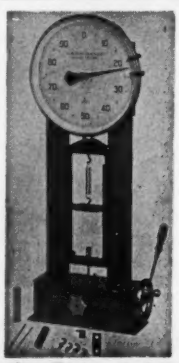
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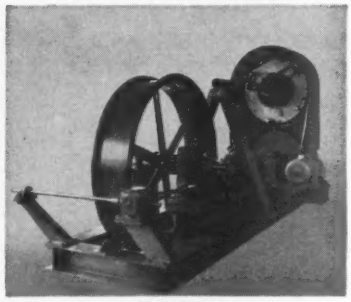

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Medium Load Spring Tester

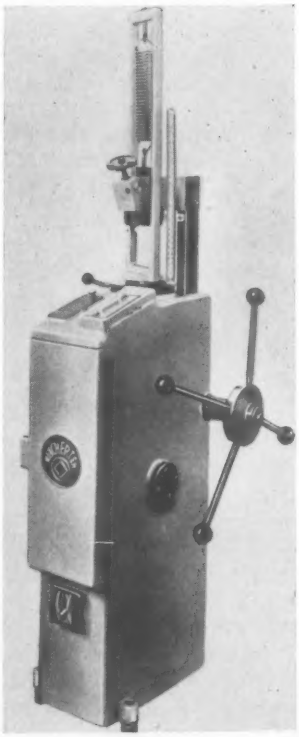
This new type hand operated spring tester uses a weighted pendulum swinging on knife edges to provide high precision testing of medium size compression and extension springs. Weight changing is not required. An optical system magnifies the exact load and shows it on an illuminated dial. The spring length is shown in decimals on a steel rule and a vernier permits readings in thousandths of an inch.

* * *

Adjustable stops and tolerance markers for rapid production testing of loads and lengths, permit up to 600 tests per hour. The tester is especially suited for pressing springs to remove permanent set and for high speed operation.

* * *

The capacity is 1 ounce to 225 pounds, with spring lengths up to 11-13/16 in. and spring diameters up to 4 in. Such springs are extensively used in the automotive, aircraft and machine tool industries.



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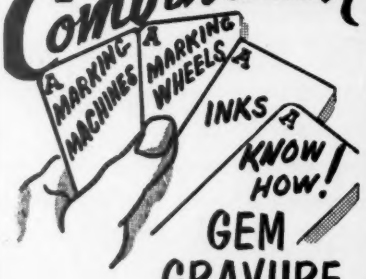

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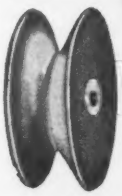

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Handbook on Wire Product Components

Case studies of how design engineers were able to cut costs and improve the quality and sales appeal of their products, through the use of wire and strip metal components, are featured in a new design handbook offered by **E. H. Titchener & Co.**, custom wire components manufacturer of Binghamton, N. Y.

* * *

The handbook also describes the major types of wire available for component construction, the most popular finishes, wire sizes and the variety of end treatments, threading and forming possible.

* * *

The 22-page handbook, which also describes Titchener's design and manufacturing facilities, may be obtained by writing Custom Design Department, E. H. Titchener & Co., 57 Clinton Street, Binghamton, N. Y.

Forms Special Products Division

The J. S. Screw Division of the J. Schwartzman Mfg. and Supply Co. due to the increased demand for cold headed specials has formed the J. S. Special Products Division to handle the technical and engineering service for the manufacture of such items as pins, studs, rivets, ball rods, hinge pins, blanks, and many other special fasteners of all sizes and descriptions.

* * *

In making its announcement J. S. Screw Mfg. Co., which in its modern 50,000 square foot plant turns out over three million precision fasteners a day, pointed out that many items are adaptable for cold heading. A part previously machined at a cost of 28 cents is made on this companies cold heading techniques for only 2 cents.

* * *

The company calls attention to the fact that many materials can be cold headed into precision fasteners such as brass, silicon bronze, aluminum, stainless steel, gold,

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New Louis Allis Research Center

The Louis Allis Company, Milwaukee, Wisconsin, manufacturer of electric motors, generators and adjustable speed drives has announced the construction of a new research and development center in the neighboring suburb of Greendale, Wisconsin. The building, which will be staffed by 100 engineers and technicians, will double the size of the present engineering and physics laboratories.

* * *

According to T. R. Wieseman, Vice-President in Charge of Engineering, the company's research and development plans include electronic and nuclear areas which will permit even greater penetration into industrial, and military fields.

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Wire Association Convention Date Correction

In a letter recently mailed to members of The Wire Association, the Annual Convention dates were erroneously stated. The correct dates are

NOVEMBER 14-17, 1960

Please note these dates for your future guidance in making plans to attend the Convention.

* * *

The letter in question solicited papers for the technical sessions.

Wire Kinks

(*Continued from page* 91)

dependent upon the temperature rise at the catalyst. This combustion is accomplished by the catalyst at relatively low temperature — 400° to 500° F — whereas if direct incineration by flame were attempted, temperatures up to 1400° F would be necessary.

* * *

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Nopco Chemical Company, Harrison, N. J.
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(See Compounds—Wire Drawing)

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Glader Wm., Machine Works, Chicago, Ill.
Takemura & Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Bobbin Winders
Associated American Winding Machinery, Inc., New York, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Takemura & Co., Ltd., New York, N. Y.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Chain Making
Larmuth and Bulmer, Limited, Manchester, England
Pan American Supply Company, New York, N. Y.
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Larmuth and Bulmer, Limited, Manchester, England
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N.J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Cold Heading
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Steel & Wire Machinery Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Pan American Supply Company, New York, N. Y.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Pangborn Corporation, Hagerstown, Md.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Diameter Control
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Sjogren Tool & Machine Co., Auburn, Mass.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corporation, New York, N. Y.
General Machine Tool Co., Worcester, Mass.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Eccentricity Control (Insulated Wire)
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Edging (See MACHINERY—Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Royle, John, & Sons, Paterson, N. J.

Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Wafios Machinery Corp., Hackensask, N. J.

MACHINERY—Flat Wire
General Machine Tool Co., Worcester, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Stanat Manufacturing Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Galvanizing Wire
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Impregnation Control, Paper Cables
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia, Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Diam., Insulated Wire
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Co., Tiffin, Ohio
National Mach'y Exch. (Used), New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Paper Clips
Pan American Supply Company, New York, N. Y.

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Pin Making
Takemura & Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Printing on Electric Wire
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Machine Tool Co., Worcester, Mass.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Vaughn Machinery Co., Cuyahoga Fall, Ohio
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Ring Forming
Pan American Supply Company, New York, N. Y.

MACHINERY—Rod Mill
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Special
General Machine Tool Co., Worcester, Mass.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells Company, Frank L., Kenosha, Wisc.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Staple Making
Pan American Supply Company, New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Straightening & Cutting
American Laubscher Corporation, New York, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Patterson, George C. Machine Co., Cleveland Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Krupp, Fried., Machinen-Und Stahlbau Rheinhausen, Germany
Larmuth & Bulmer Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A., Co., Inc., Cleveland, Ohio
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine) France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Thread Rolling
Boltmaster Co., Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.

Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Welded Wire Mesh
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Schlatter, Ltd., H. A., Zollikon/Zurich

MACHINERY—Wire Weaving
Takemura & Co., Ltd., New York, N. Y.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Associated American Winding Machinery, Inc., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Machine Tool Co., Worcester, Mass.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Wire and Machinery Co., Cleveland, Ohio
Superior Tool & Machinery Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Takemura Co., Ltd., New York, N. Y.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wire Machinery Inc., Chicago, Ill.

MACHINERY—Wire Forming
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Takemura Co., Ltd., New York, N. Y.

MACHINERY—Wire Preheating
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Wire Rope
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp., New York, N. Y.
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Company, Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pan American Trade Development Corp. New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Machine Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAINT BONDING CHEMICAL
Amchem Products, Inc., Ambler, Pa.

PAINTS—Heat Resisting
Amchem Products, Inc., Ambler, Pa.

PAPER—Insulating
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, Naugatuck, Conn.

PRINTING WHEELS—for Electric Wire
Daniels & Co., Frank, New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Mettler Machine Tool, Inc., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio
Wood's Sons Company, T. B., Chambersburg, Pa.

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New York Engineering Corp., Yonkers, N. Y.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Steel, for Rope and Cable
New York Engineering Corp., Yonkers, N. Y.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Nelson Co., The, Baltimore, Md.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Woodcraft Company, Bay City, Michigan

REELS & SPOOLS—Wood
American Wood Working Co., Montello, Wisc.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Nelson Co., The, Baltimore, Md.
Woodcraft Company, Bay City, Michigan

REFRACTIONS—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pan American Trade Development Corp. New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio

ROLLS—For Flattening Wire
General Machine Tool Co., Worcester, Mass.

ROPE—Wire
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons, Div. Colorado Fuel & Iron Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Removing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—Plastic
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div. Colorado Fuel & Iron Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, W.-Germany)

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TENSION METERS—for Wire
Boulin Instrument Corporation, Pelham, N. Y.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Tensitron, Inc., Harvard, Mass.

TESTERS—INSULATION
(See Testing Equipment—for Dielectric Faults)

TESTING EQUIPMENT — Dielectric Faults in Insulation
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.

Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Peschel Electronics, Inc., Patterson, N. Y.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

TESTING EQUIPMENT — Physical
Scott Testers, Inc., Providence, R. I.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable speed (See Adjustible Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WAXES—for Insulated Wire
Cary Chemicals, Inc., New Brunswick, N. J.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Micro Products Co., Chicago, Ill.
Schlatter, Ltd., H. A., Zollikon-Zurich

WHEELS—for Printing on Electric Wire
Daniels & Co., Frank, New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—Aluminum
Malin & Co., The, Cleveland, Ohio
Scovill Mfg Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Ball
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Bunched and Stranded
Camden Wire Company, Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Copper
Camden Wire Company, Camden, N. Y.
Malin & Co., The, Cleveland, Ohio
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
Camden Wire Company, Camden, N. Y.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Jones & Laughlin Steel Corp, Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pan American Trade Development Corp., New York, N. Y.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado, Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Detroit Steel Corporation, Detroit, Mich.
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Marathon Specialty Steels, Inc., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Berger Div., Canton, Ohio
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Metalizing
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Platt Bros & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio

WIRE—Needle
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pan American Trade Development Corp., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Marathon Specialty Steels, Inc., New York, N. Y.
Pan American Trade Development Corp., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Stainless Steel
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
Nippon Stainless Steel Wire Mfg. Co., Ltd., Osaka, Japan
Pan American Trade Development Corp., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Pan American Trade Development Corp., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Upholstery and Mattress
Pan American Trade Development Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Synthetic Thread Co., Bethlehem, Pa.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

WATSON

AUTOMATIC TRAVERSES

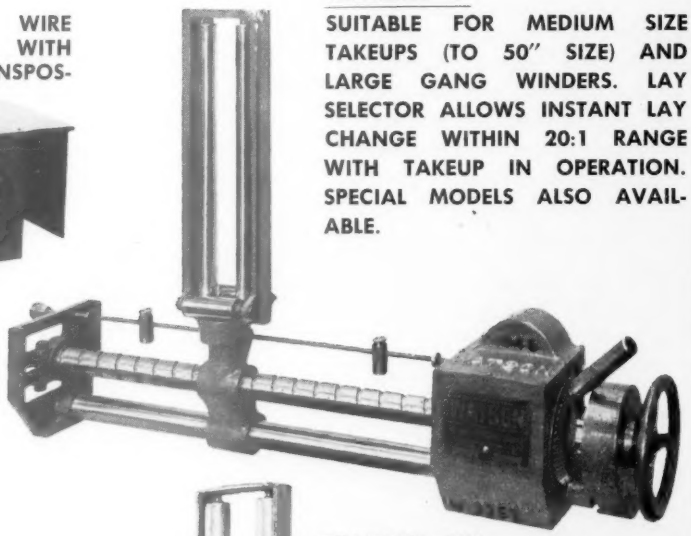
STANDARD STOCK MODELS SHOWN. SUITABLE AS REPLACEMENTS OF INADEQUATE MECHANISMS. SUITABLE FOR APPLICATIONS WHERE A POWERFUL RECIPROCATING MOTION IS REQUIRED.

TRAVERSE "E"

CAPABLE OF FUNCTIONING AT HIGH WIRE TENSIONS AND COMMONLY FURNISHED WITH SMALL STRANDERS AND WINDERS. TRANSPOSABLE CHANGE GEARS PROVIDE FOR LAY VARIATION SETTING.

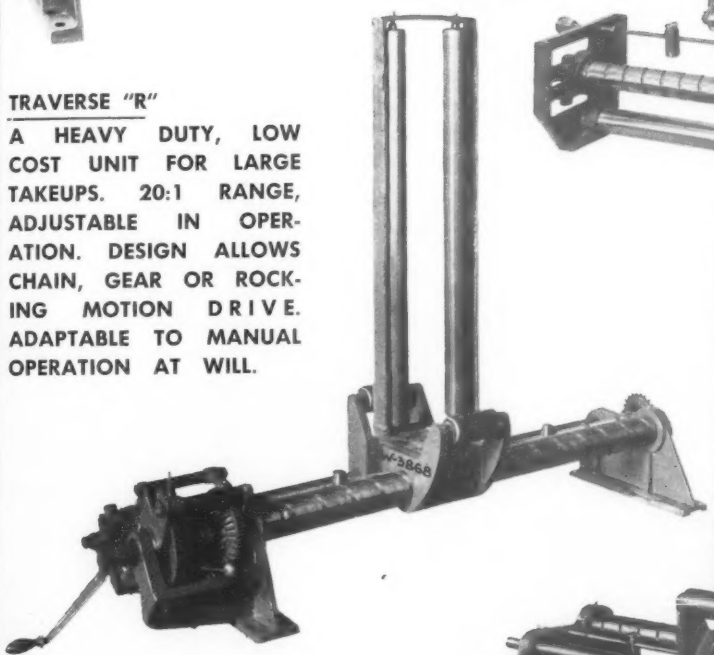
TRAVERSE "C"

SUITABLE FOR MEDIUM SIZE TAKEUPS (TO 50" SIZE) AND LARGE GANG WINDERS. LAY SELECTOR ALLOWS INSTANT LAY CHANGE WITHIN 20:1 RANGE WITH TAKEUP IN OPERATION. SPECIAL MODELS ALSO AVAILABLE.



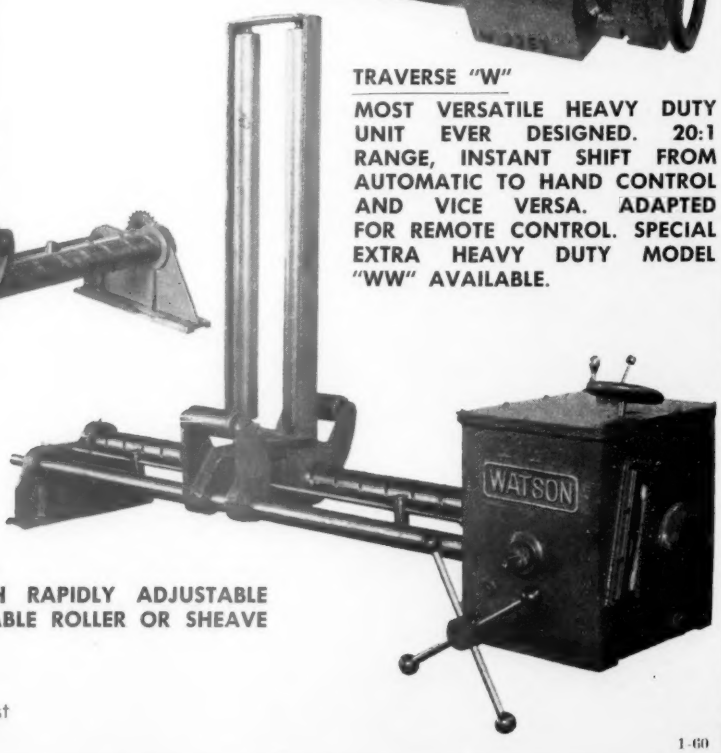
TRAVERSE "R"

A HEAVY DUTY, LOW COST UNIT FOR LARGE TAKEUPS. 20:1 RANGE, ADJUSTABLE IN OPERATION. DESIGN ALLOWS CHAIN, GEAR OR ROCKING MOTION DRIVE. ADAPTABLE TO MANUAL OPERATION AT WILL.



TRAVERSE "W"

MOST VERSATILE HEAVY DUTY UNIT EVER DESIGNED. 20:1 RANGE, INSTANT SHIFT FROM AUTOMATIC TO HAND CONTROL AND VICE VERSA. ADAPTED FOR REMOTE CONTROL. SPECIAL EXTRA HEAVY DUTY MODEL "WW" AVAILABLE.



ALL MODELS AND TYPES PROVIDED WITH RAPIDLY ADJUSTABLE END POINT SETTING STOPS. INTERCHANGEABLE ROLLER OR SHEAVE GUIDE PROVIDED TO SUIT REQUIREMENTS.

* * * *

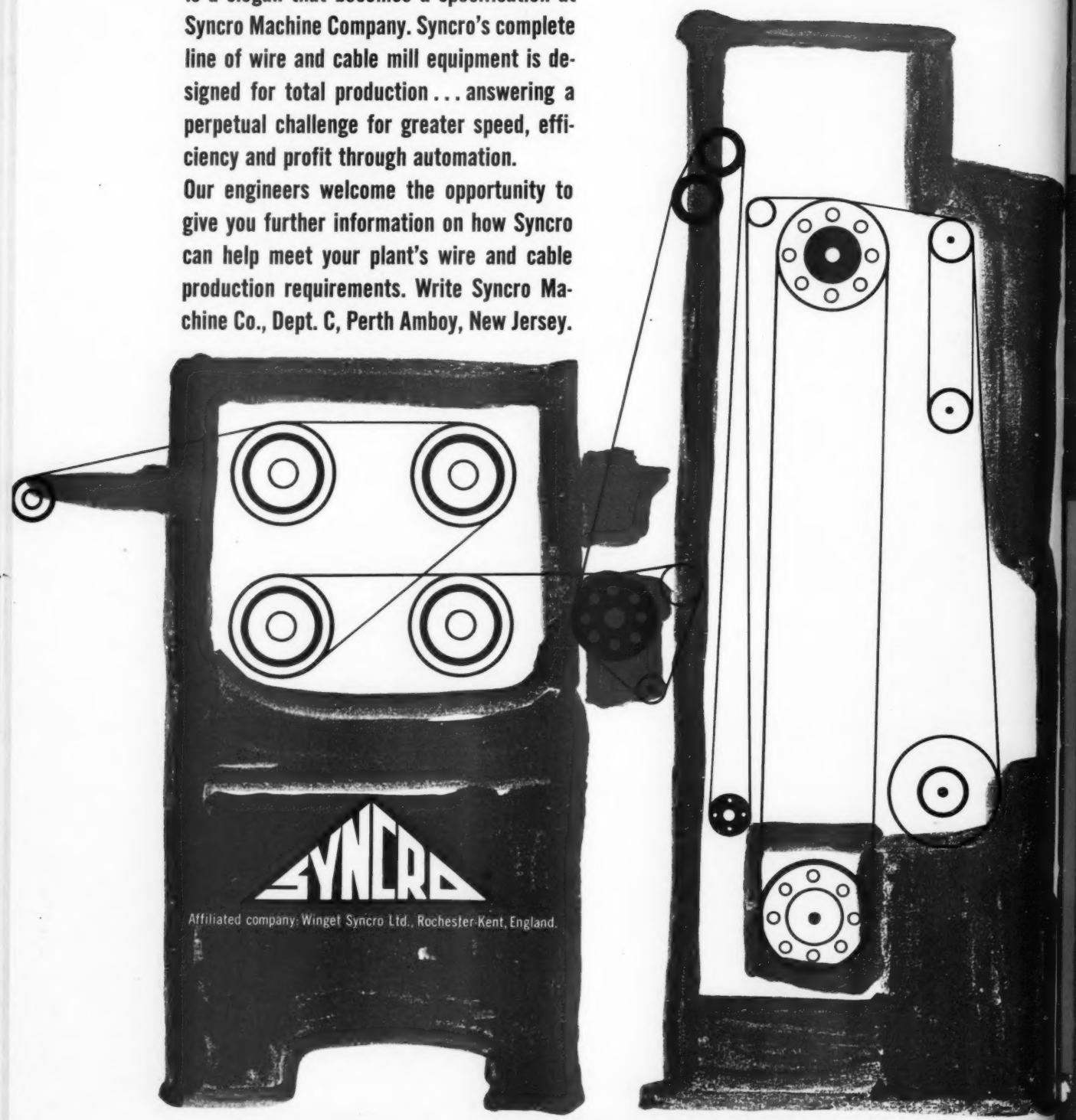
Details Upon Request

1-60

"better machinery for the wire industry..

is a slogan that becomes a specification at Syncro Machine Company. Syncro's complete line of wire and cable mill equipment is designed for total production . . . answering a perpetual challenge for greater speed, efficiency and profit through automation.

Our engineers welcome the opportunity to give you further information on how Syncro can help meet your plant's wire and cable production requirements. Write Syncro Machine Co., Dept. C, Perth Amboy, New Jersey.



Affiliated company: Winget Syncro Ltd., Rochester-Kent, England.

RESISTONEAL—SPOOLER model AB—3S Pace setter for electric resistance annealing, and spooling of copper wire in combination with SYNCRO model AB and BG highspeed wire drawing machines producing quality wire sizes from #26 to #34 B & S gauge.

WIRE DRAWING MACHINES — STRANDERS — CONTINUOUS ELECTRIC ANNEALERS — PAYOFFS — CAPSTANS — WIRE INSULATORS — HEAVY DUTY TAKEUPS — TAPERS — SPECIAL MACHI